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AMERICAN HUSBANDRY:

BEING

A SERIES OF ESSAYS ON AGRICULTURE.

COMPILED PRINCIPALLY FROM "THE CULTIVATOR" AND
"THE GENESEE FARMER."

WITH ADDITIONS.

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AMERICAN HUSBANDRY.

CHAPTER I.

HISTORICAL NOTICES OF AGRICULTURE.

Origin and Necessity of Agriculture.—Ancient Method of Tilling the Soil.—Greek and Roman Agriculture.—Early English Agriculture.—Improvements in Stock and Farming Processes.—Modern Agriculture.

[THE oldest occupation of mankind was that of cultivating the earth; and from the time that the first pair, "hand-in-hand," went forth exiles from Paradise, it has constituted the great business of the human race. Cain was a tiller of the ground, Abel was a wool-grower, and Noah was a husbandman. To Moses we are obliged to look for the first history of agriculture, as well as the earliest records of our race. Traditionary accounts in later writers of antiquity trace its history far back towards the Noachian period, but the earliest catalogue of domestic animals, and the first direct statements of the condition of patriarchal society, are to be found in the history of Abraham.

Ingenious writers, as Stillingfleet and Newton, Rennell and Grimm, have endeavoured to trace the origin of agriculture to some particular part of the world, and Egypt seems to have been a favourite starting-point with these and other writers. That "corn" was very early and extensively grown in Egypt, cannot be doubted; but the culture of grain there, rather than in the other districts then occupied by the human race, appears to have been as

much the result of the ease with which the banks of the Nile could then, as now, be cultivated, as of any positive advances in agriculture. There appears little room for question, that, wherever man was found, the cultivation of the soil more or less prevailed. There is no reason to suppose that the state of things in the plains of Mesopotamia, Tartary, or Arabia, five thousand years ago, differed essentially from the present; and as we know that three thousand years have passed over them, and left their habits and their systems of agriculture unchanged, those habits and systems may be considered a fair specimen of those which the necessities of man first originated, and which have been there perpetuated.

As must have been expected, the implements used in the infancy of agriculture were of the most simple kind. The most ancient sculptures and coins, and, above all, the paintings found in such perfect preservation in the long-deserted temples and tombs of Egypt, afford the most ample evidence on this point. That the earliest instrument used to loosen the soil was a kind of pick, made at first of stone, bound to a handle of wood, is certain. The employment of animal instead of human labour in tilling the soil, or the substitution of the first for the last, early occurred; and the use of heifers in ploughing, or, where these were not at hand, the substitution of the ass, is clear from the frequent historical notices of these facts.

It is to the necessity which agriculture forced upon men, of associating for the protection and preservation of their crops, that the origin of society may fairly be traced; otherwise the world would have remained, as it now mostly is where agriculture is unknown, a mass of isolated families, with conflicting interests, and constant additions to the elements of dissension and confusion. The right of soil, the nature of property, the accumulation of

wealth, the progress of civilization, and the spread of knowledge, are all, more or less, to be traced back to such associations, and to the permanent occupancy of the earth, to which societies like these gave a tendency and security. To live, it was necessary to sow; to induce men to sow, security must be given that what is sown shall be reaped for the benefit of the sower; and an association of families, or, in other words, society, could only do this; and thus to agriculture, to the tilling of the soil, we owe civilization and its multitudinous blessings.

Only incidental notices of the principal articles of cultivation in these primitive times are to be found in the writers of those periods, or, indeed, much later. Rice was grown wherever it could be cultivated; barley was early introduced; according to Herodotus, wheat was not grown by the Egyptians, and bread made from it was despised by them; no root except the onion and the garlic is mentioned; beans were held in abomination by most of the ancient nations; and maize, or what we call corn, was entirely unknown among them. It is evident that the principal means of subsistence were found in rice, barley, wheat, and in the flocks and herds, of which they usually had great store. It is plain, from Moses, Homer, and Herodotus, that flesh formed a more important part of human food among the shepherd or migratory clans than among the inhabitants of the plains, and more among all, unless we except the Egyptians, than at the present time.

One of the most ancient ploughs figured is made of a branch of a tree, a projecting limb of which, cut off and sharpened, forms the share or point for moving the earth, while an ox is used for draught; and, at a much later period, the form had not altered materially, except that a piece of stone or metal was secured by thongs of raw hide to the point, and thus the implement was rendered more durable as well as efficacious. From paintings and sculptures

of the ancients, it appears that their grain was cut with a sickle or short scythe, not differing essentially in form or operation from those now in use, as after the reaper most of the stubble seems to have been left. At first seed was sown and raked in by hand; but the square harrows that hang on the shoulders of Osiris, with the other implements of agriculture, show that, in Egypt at least, agriculture had advanced considerably from its primitive simplicity and rudeness.

Hesiod, a Grecian writer who lived ten centuries B.C., has given one of the most full and interesting accounts of ancient agriculture. The grains at present cultivated were then common; the leguminous plants, with the vine, fig, olive, date, apple, and some other fruits, had been introduced; and though sheep, swine, goats, mules, cattle, asses, and horses were abundant, there is no intimation that herbage plants or artificial grasses had been brought into cultivation. Flax was common, and hay was made from natural meadows.

Notwithstanding the imperfect modes practised by the ancients, we have many incidental notices that show the productiveness of soils in those early days. Moses describes the farming of Isaac at Gerar, and gives him a crop of a hundred fold. Mark makes the seed sown on good ground produce thirty, forty, sixty, or a hundred fold. Varro asserts, that some of the most fertile districts of Spain produced a hundred to one. Pliny, in his Natural History, says, "There was sent from Byzacium in Africa, to Augustus, by his factor, nearly 400 stalks, all from one grain; and to Nero, 340 stalks." He adds, "I have seen the soil of this field, which, when dry, the stoutest team cannot plough; but after rain, I have seen it opened up by a share drawn by a wretched ass on one side and an old woman on the other." It is such accidental sketches as these that exhibit, not only the state of agriculture, but the state of society and the human race in those ages.

In one respect, wherever the conquering arm of Roman power was felt, it was felt as a benefit. The advanced agriculture which distinguished the Roman states, as compared with the nations around them, followed in the train of their armies, and, unlike most ancient or modern soldiers, those of Rome, when not employed in active service, were engaged in cultivating the soil wherever they happened to be. Thus an improved husbandry was introduced into the African regions of the Mediterranean on the south, and into Gaul, Germany, and Britain on the north; and with it came the germe of learning and civilization.

The terrible revulsions, however, that attended the downfall of Rome, and the tenfold night into which all the interests of learning, science, religion, and the arts were thrown, was not less decisive in its ruinous effects on the cause of improved agriculture. The world appeared to have relapsed into barbarism; and the only places where attention was paid to the cultivation of the soil was on the lands belonging to the religious houses of Europe, as the tenants of these were mainly safe, the plunderers and marauders that ravaged the rest of the countries being awed by the dread of encountering the thunders of the Church. With the revival of letters, and particularly with the discovery of printing, rural affairs began to receive greater attention; but, instead of experimenting for themselves, those who took the lead on these topics contented themselves with the methods of the Greek and Roman writers, as inculcated in the collection called the *De Re Rustica.*

England now began to assume that supremacy in husbandry which, with some few exceptions, and those more owing, perhaps, to the faults of her climate than the remissness of her population, she has maintained over other European countries. As from that country we have derived our principles of agri-

culture, our systems of farming, our implements for tilling the soil, many of the plants we cultivate, and nearly all our flocks and herds; and as we are still continually making accessions to our domestic animals from her improved breeds, and availing ourselves of the benefits she has derived from a long series of experiments, to which science has largely contributed, a more full account of the progress of agriculture in that country may not be amiss.

The first English writer of note was Fitzherbert who published his "*Book of Husbandrie*" in 1523. This work throws much light on rural affairs at that time. The man who had land of his own was very independent. His living was simple, and he had no luxuries. Money was seldom seen in his possession. Wool was the principal article sold. Sheep were kept on extensive commons, and folding them on ploughed land was the principal mode of recruiting it when exhausted. As the artificial grasses and roots were unknown, there was no fodder for winter but the coarse, natural grasses, and in severe seasons both cattle and sheep perished by thousands. Little fresh meat was seen after Christmas, as there was no means of winter-fattening animals, and in autumn the farmer killed and salted enough beef and mutton to last him until the next summer.

During the next century after the publication of Fitzherbert's treatise, although there were some writers on husbandry, such as Tusser, Googe, and Platt (the former of whom asserted that the Spanish sheep, which now began to be celebrated for their wool, were derived from England), yet no considerable change took place in the breeding of sheep or cattle, or in the former methods of cultivating the soil. Still the condition of the farmer appears to have been gradually improving. The farmhouses were more commodious and better built; and while all increased in domestic comforts, some had accumulated considerable wealth.

The merit of introducing clover into use as a grass in England belongs to Walter Bligh, who published in 1652 his "Improver Improved," a work full of valuable facts, and containing many things worthy of notice at the present day. Soon after this, Weston gave agriculture the most decided impulse it had received for a long time, by publishing an account of the field-cultivation of the turnip in Flanders, where this root had received great attention for some years. Valuable as the culture has proved to England, nearly doubling her agricultural products within the last sixty years, turnips were obliged to encounter the most absurd prejudices, and it was a long time before they succeeded in becoming an object of general favour. To the introduction of clover and turnips, more, perhaps, than to any other single cause, may be attributed the rapid advancement of agriculture in that kingdom. Their use renders a rotation of crops imperative, and this both science and experience unite in asserting to be the only true mode of making cultivation profitable, and, at the same time, constantly improve the soil.

Jethro Tull was the first English farmer who brought himself into any considerable notice by improvements on the preceding systems of cultivating plants by a different treatment of the soil. His system was based on the facts he had observed in Lombardy, on the rich alluvial of the Po, where the vegetables are planted in rows, with wide intervals, and the earth frequently stirred between them. Gardeners, too, adopt a similar course, and Tull conceived the idea that the same course could be advantageously introduced into the culture of field-crops; hence the origin of what is called the Drill Husbandry, and the practice of horse-hoeing. So far the system of Tull was admirable; but he had also imbibed a notion that the earths, finely attenuated or pulverized, were the food of plants, and that manures were unnecessary where the system of

pulverization was thoroughly attended to. Chymistry had not then shown the nature of the earths, or the part they perform in vegetation, nor had the nutritive principles of matter been ascertained to the degree they have been by the labours of Chaptal and Davy. The error of Tull, therefore, was a pardonable, though a most pernicious one, as, by allowing manures to act only mechanically, or as the addition of so much common earth, he conceived they might be entirely dispensed with, provided the system of pulverization was closely followed. Tull's theory attracted much attention, as it seemed to establish the position that where manures were limited and labour abundant (precisely the case of England), the application of this labour to the soil, without reference to manures, could supply any supposed increase of population with food. His theory he was accustomed to sum up in these words: "By continually stirring the earth, we may keep it continually fertile." Tull lived, however, to witness the fallacy of his conclusions, and found that he had carried his imaginations too far; as the deterioration of the soil of his extensive farm, subjected to his mode of treatment and experiments, so far reduced his crops as seriously to impair his fortune and his prospects. The introduction of the drill husbandry must, however, be considered a great advance in agriculture; and even his errors were not without their use, by directing the attention of reflecting and practical men to the causes of his failure, and serving as warnings not to deviate, in cultivating the soil, so widely from the course nature so clearly points out. It served to demonstrate the value and necessity of manures, and the propriety of a change or rotation of crops; things which Tull most pointedly opposed. Tull admitted the value of a change of seed, while he derided the idea of a change of crop, and was severe on Woodward and Bradley in the controversy to which his opinions

gave rise. His "Horse-hoeing Husbandry" was published in 1731, and from this drill husbandry may be said to date.

The introduction of clover and other artificial grasses for pasture and mowing, and the impulse given to the turnip-culture, had directed the attention of farmers to the improvement of cattle and sheep, and a manifest change in the size and quality of the fat cattle and sheep offered in the London markets began to appear. Robert Bakewell's name has become justly famed for the improvements he introduced in the raising of sheep; a course which the Collings afterward, in a great measure, adopted in their treatment of cattle, and with the same beneficial results. The Bakewell, Dishley, or New Leicester sheep (for by all these names have they been successively known) are remarkable for their early maturity; returning a great quantity of mutton for the food they consume, and the small proportion the offal bears to the weight of the four quarters. These sheep, or some of their many crosses, are spread over the most fertile grain-growing districts of England; and, from their being easily made into mutton, are preferred wherever meat is a greater object than wool, or the sheep-husbandry is combined with the turnip-culture and the rotation of crops.

The improvement in sheep, cattle, &c., effected by Bakewell, the Culleys, Collings, Berry, and others, was accomplished by the skilful choice of animals, in the first place, to breed from, and then pursuing this course without any regard, in many cases, to consanguinity or nearness of blood. The principal reliance was placed on the ram or the bull, and the greatest efforts were directed to produce these animals of the best possible quality. Bulls and rams were bred by these men extensively, for the purpose of letting to other farmers, and they obtained the most enormous prices for their services. In no

other way could the benefits of improvement in cattle or sheep have been so rapidly or certainly spread; and the benefits of a division of labour in cattle-breeding, as well as in other pursuits, became at once manifest. The improved Durhams, or Short Horns of Colling and Berry, have, along with the Leicesters, spread wherever a suitable climate and rich pastures render the introduction of such animals proper. A decided improvement, though not, perhaps, to the same extent, has taken place with the other breeds of cattle and sheep cultivated in England, such as the Devon and Hereford cattle, and the South Down and other short-wooled sheep.

The substitution of the horse for the ox in those districts where, in consequence of an improved system of agriculture, the turnip-culture, and a rotation of crops, much grain is raised and much ploughing necessarily required, has been among the means to advance agriculture materially. Although, on all small farms, or where the attention is principally directed to the raising of animals or the making of hay, oxen are to be preferred to horses, as less costly, less expensive in keeping, less subject to disease or injury, and, when unfit for labour, still of value for fattening; still, on large farms, or where much ploughing is to be done in a limited time, as it always must be where a skilful course of cropping is practised, horses are indispensable. The mode of managing the horse-team had been most barbarous and awkward, as, where two or more were worked together, it was the practice to place one before the other; and when men of sense and correct theory became convinced that a different mode of working was preferable, and that two horses abreast would manage a plough better than three or four driven tandem, it required all the authority of the landholder, and the influence and example of the nobleman, to overcome the prejudice with which the labourer regarded the innovation.

The bringing of mechanical ingenuity and the combinations of science to bear upon the construction of agricultural implements, had an excellent effect on the cause of cultivation. Iron had, indeed, been substituted for wood in the making of such implements, but few improvements in their construction, over the simple forms of antiquity, had been attempted. All innovation was met at the threshold by the dogged obstinacy of the labourer, whose attachment to old methods could with difficulty be shaken; and it was long before such indispensable things as the fanning-mill and the threshing-machine, now so common everywhere, could be freely permitted in England. All machines termed labour-saving have been, from the first, looked upon with suspicion in that country: and drills, horse-rakes, threshing-machines, &c., &c., have been repeatedly denounced, and not unfrequently destroyed. This will always be the case in a country where land is scarce and labour abundant, as it is clear that where a horse and one man can perform the work of a dozen men, it must be regarded in the same light as throwing ten men out of employment. In the United States the difficulty is to obtain labour, as unoccupied land is so abundant and cheap, that it is a matter of favour rather than otherwise when the labourer works for another rather than himself; consequently, the prejudices that so seriously retard agricultural improvements cannot exist here.

The investigations that attended the failure of Tull's system placed the doctrine of rotation and the necessity of manures on a foundation not to be shaken. Davy had shown the nutritive powers of plants relatively and positively; and the analysis of soils, now systematically undertaken, served to explain why some were fertile and others the reverse. It is true, much on these and similar points remains for science to perform; yet when it is recollected how very limited the time has been since

science has been considered at all applicable to agriculture, it is matter of gratulation that so much has already been accomplished. The field-culture of the potato began not far from 1750, and probably has increased the means of human subsistence in a greater degree, wherever it can be cultivated, than any other single plant. Spring wheat did not come into extensive use as a crop in England until about the commencement of the present century. It has operated advantageously on lands not suitable to fall or winter wheat, and of that, as well as of barley and oats, several varieties, superior in quality and more productive than the old, have been originated.

Draining, which may be said to date from about 1760, has become an important aid to agriculture, and by its skilful application millions of acres, comparatively worthless, have been made very valuable and productive. All soils kept constantly wet, or liable to stagnant water, will always be cold and poor. By draining off this water and allowing the free access of atmospheric influences, aided by moving the soil with the plough, it soon becomes less heavy and cold, and immediately becomes fertile and productive. The use of lime in agriculture has been attributed to Pringle; but, although he may deserve the credit of first publicly calling the attention of the agricultural public to it as a manure, its value for soils had been understood for centuries, as the ancient writings we have alluded to most convincingly prove. Its use in England has continued to increase, and it now forms one of the most important items in a course of renovating and ameliorating the soil in that kingdom.

Coming, as the first colonists of the United States did, direct from the British Isles, and the intercourse with that country having continued, with only two slight interruptions, until the present time, it would follow, as a matter of course, that our modes of thinking and acting should be, in a great degree,

fashioned by those of the fatherland. This is easily observable in our literature and our laws, and not less strikingly so in our agriculture. With some few modifications, then, such as may be traced to climate, or the different social conditions of the two countries, the agriculture of the United States may be said to resemble that of England very closely. The circumstances in which the American farmer finds himself placed, has forced him to adopt methods of farming at variance with those of older and more densely-peopled countries, and often at variance with the opinions of those most deeply skilled in the theory of agriculture. In Great Britain and other European countries, land is dear and labour is cheap ; as a matter of course, the farmer of the old country is led, by a regard to his own interest, to make the most of his land, while in this country there is the same inducement to make the most of what labour can be commanded. This leads to an extension of farms and of cultivation, which forms a striking contrast to the limited farms and high culture of the English or Flemish farmer; and though, by being carried too far, it forms an evil of no trifling magnitude, it is one which must gradually correct itself as population becomes more dense, the West generally settled, and the temptations to emigration from that source lessened by the action of these causes.

The geographical and meteorological condition of the United States, as compared with that of Great Britain, has not been without a decided influence in modifying the character of our agriculture. This country embraces, owing to its geographical position a range of climate and production greater than the whole of Europe. While we can grow to any imaginable extent the cereal graminæ of the North, our southern limits stretch into the tropical climate so far as to give us the two great productions of cotton and sugar, articles beyond the range of Eu-

ropean culture. In addition to this, the peculiar constitution of our climate, the intense heat and dryness of our summer months, enables us to grow over the whole extent of our country that invaluable plant, the Indian corn, which can be grown in perfection in but a small part of Europe, and in a large part of it, including the British islands, not at all. The heat and dryness of our summer months, however, while they give us our corn, are not without their disadvantages in some other respects; and, as they render other cultivated crops liable at times to suffer with drought, they will probably have the effect of circumscribing the turnip-culture among us, and, from the experiments which have been made, would seem to forbid the existence of line-fences or hedges, at least from the same plants that constitute the numerous and beautiful ones of Great Britain.

While our grains and grasses have been derived from abroad, our domestic animals have originated from the same source. Our horses, cattle, sheep, and swine are of European parentage, uniting and blending all the known varieties of each race in inextricable confusion. As theirs have improved, so have ours, though perhaps in a less degree; but the continual importation of animals from England to this country has at least given us representatives of every variety of her breeds, and of every shade of blood she can boast. The astonishing improvement made in breeding cattle in England, and which have already been alluded to, have not been without their influence on our enterprising farmers, and great numbers of the choicest animals that country could boast have found their way to our country. The beautiful Short Horns and Devons, the Leicesters and South Downs, the Cheshire and the Berkshire pigs, have all been largely imported, and are already exercising a vast influence on the general character of our animals. Ohio and Kentucky have done much

in the way of cattle and horses; Pennsylvania and New-York have given their attention to cattle and swine; and New-England to all, as pasture has been more an object with her than grain; and the feeding of animals has long constituted a prominent part of her industry. But perhaps there is no one animal which has exercised a greater influence on the productive interests of the country than the fine-wooled or Merino sheep, which, within the last twenty years, has spread to such an extent as almost to have superseded the old breeds of coarse-wooled animals in the states. Fifty years since, the Merino was unknown in the country; at the present time there are not less than ten or twelve millions of these animals, of all grades, in the possession of our farmers, and the growing of fine wool is an important item in the business of the United States. Great Britain has made many unsuccessful efforts to introduce these fine-wooled sheep of Spanish origin for the use of her manufactories, but appears to have abandoned the project, and attends to the improvement of the hardier, long-wooled sheep, as giving a greater weight of wool and of flesh than the finer varieties.

In summing up, in few words, the most important points of advantage in the modern agriculture over the old methods, and for many of which we are indebted to the application of science to tilling the soil, we may mention, 1st. The knowledge and means of analyzing soils, determining their constituents, and what is required to constitute them fertile. 2d. Vastly improved methods of preparing and using mineral, animal, and vegetable manures. 3d. The introduction of drill husbandry and horse-hoeing instead of cultivation by hand. 4th. The field-cultivation of roots, by which a far greater amount of food can be grown on a given quantity of land than in any other way. 5th. The substitution of root or green crops for a naked fallow; thus giving roots

the first application of manures, and making the ground clean by the crop and the hoe. 6th. The improvement of animals by skilful crossing and selection, the scientific application of these principles belonging exclusively to the moderns. 7th. The originating new and valuable varieties of vegetables, by crosses or as seedlings, many of which, among the roots, fruits, and grains, have superseded in cultivation the original stocks from which they sprung. 8th. The invention of many new labour-saving machines, and the improvement of most others used in agriculture. In this respect the processes of agriculture in use at present are far superior to those of the ancients, adding both ease and facility of execution to many farming operations formerly of the most tedious and toilsome kind. *Eds.*]

CHAPTER II.

COMPARATIVE AGRICULTURE OF ENGLAND AND AMERICA.

Importance of Agriculture to the Country.—Adaptation of English Agriculture to the United States.—Necessary Variations. —Difference of Climate.—Its effect on our Agriculture.

Agriculture, a subject always of surpassing interest to the United States, as constituting her great source of real wealth, and furnishing employment to more than two thirds of her inhabitants, has lately, from a conjunction of peculiar causes, been invested with a paramount importance, but not more so than, in our opinion, is strictly its due. Agriculture is the art of arts; or, rather, it is a science to which all others are in a degree subservient. Chymistry adds to its resources and directs its advances; printing records its progress, and scatters

the knowledge gained by experience; while health and labour, sound minds in sound bodies, follow in its train, and constitute the durable substratum on which the towering columns of liberty and the world's hope are reared. There is little danger that an employment furnishing the human race with food and clothing, which is the great source of competence and of wealth, should be spoken of too highly or too intently pursued; there is little room for fear that its operations will be too extended, or that too much light will be furnished by the labours of the scientific or experimental. On the contrary, the present state of things among us proves incontestably that the fault in this country is the other way; that with the hardiest and most enterprising population on the globe, and a soil unequalled in fertility, we have been so idle, or such improvident cultivators as to be compelled to depend on other nations for bread. Politics, and trade, and the mysteries of banking, and the haste to be rich, and speculations in stocks and western lands, have employed thousands, we might say millions, who would have been more honourably, and, it seems likely to turn out, more profitably employed in following the plough, or wielding the hoe or the axe.

The question has been not unfrequently asked, *How far are farmers in the United States justified in following the example and practices of British Agriculturists?* This question assumes an importance it would not otherwise possess, were it not a fact that we look with great interest to the results of agriculture in that country; that most of our standard agricultural works are from that side of the Atlantic; that the wealth and resources of England are such as to render that island a great theatre of experiments; and that the arts and the sciences which can be brought to bear on the cultivation of the soil, are far more extensively diffused and better understood there than here. Having the same Anglo-

Saxon descent, the influence of England is felt in every department of our social condition; in our religion, literature, and laws; and, perhaps, is as potent as anywhere in the usages and practices that belong to the cultivation of the earth. In our implements used on the farm, we copy from English models; in improving our breeds of horses, sheep, and cattle, we look to stock imported from England; in our horticulture and floriculture we follow the example of English planters and gardeners; and in our farming operations, in culture, and in the selection of grains, the influence of that country is paramount. It is necessary, then, to inquire how far we may safely follow such an example, and in what respects we ought to deviate, or when it becomes necessary to do so.

To determine this question correctly, it is necessary to take into consideration the position of the two countries, so far as regards climate, soil, and population, and their influence on plants and the prices of labour. In general, it may be laid down as a correct position, that the difference between the soils of the two countries is not of a kind to render any difference of culture important. The analysis of soils effected by Sir Humphrey Davy, the geological structure of the British islands, and the extensive and minute reports made on the soils in the agricultural surveys of the several counties, show that there is no essential difference between the composition of the greater part of the British soils and ours. Peat and bog soil alone is found more extensively diffused than with us; but this has little influence on the general progress or course of agriculture.

Two or three facts, which should cause every one to pause and reflect, meet us in the beginning of our inquiries. One of these is, that, with a population of ten millions engaged in agriculture, we are not able to, or, rather, do not provide bread for fourteen millions; and another is, that Great Britain, with an

agricultural population of five or six millions, produces enough for eighteen millions of inhabitants, besides sending us over a million or two of bushels to keep us from starving.* What is the cause of this difference is an important inquiry; and we may farther be permitted to ask, how it happens that the productiveness of cultivated land in England is constantly increasing; while here, it is an undeniable fact, that, as a whole, its fertility is retrograding? We have selected England as a point of comparison, because her agriculture, though not as perfect in some things as that of Holland or Belgium, is more familiar to us; and, from the nature of the climate and soil, presents more instances in which we might profit by a comparison. Of the two and a half millions of bushels of grain imported from abroad, though we have had cargoes from almost every nation of Europe, still the greatest quantity has been sent from England; while at the present moment there is not an article of human subsistence which we could find a market for in that country. They would be glad of raw materials, silk, wool, or cotton for their manufacturers; but of bread and meat they have not only enough for themselves, but abundance to spare.

It must be remembered, however, that the agriculture of England is confined to a single object, the production of food. Her five millions have nothing to do with foreign markets; they produce no article of such consequence to them, that grain, when compared with it, becomes of secondary importance;

* This is strongly put, and may lead to a wrong conclusion. That this country has, within the last three years, imported breadstuffs from England, is true; though, in every such instance, it is believed to have been foreign grain bonded in that country. Such, however, is not the ordinary course of things. England has little, if any, grain beyond her own wants, in the *most favourable seasons:* the United States always produce more than they require for home consumption, except in the *most unfavourable seasons.*

their time and skill are employed in providing food for home consumption—for themselves and the nation. In this country, on the contrary, nearly one third of the individuals employed in tilling the soil do nothing, comparatively, in providing a supply of food. It is their business to furnish an article to sell, not to eat; and, instead of providing for others, they do not even produce bread for themselves. We shall be understood, of course, as alluding to the negroes of the South, where cotton is the great object of the planter, who relies for his bread on purchases from the free agriculture of the North and West. A recollection of this fact will show that the food-producing power of the two nations is not so widely different as the first view would indicate; still the disparity in the amount of produce, compared with the respective number of labourers, is such as to demonstrate that causes worthy of investigation are actively at work.

From the statements of some recent writers on British statistics, it appears that the advance of that country in agriculture has been equal to her progress in manufactures. In 1755, the population of Great Britain was estimated at seven millions and a half; it is now 17 millions and a half. In 1760, the amount of all kinds of grain grown in the island was about 170 millions of bushels. In 1835, the quantity was estimated at 340 millions of bushels. That the great mass of the people in that country are much better fed and clothed than they were 80 years since, does not admit of a question; and the present value of the bread and meat consumed in England has been estimated by British writers of authority at 700 millions of dollars. Yet Georgia, Virginia, Missouri, or Illinois contain as many square miles as England, and New-York does not fall much below; still present appearances would indicate that it will be a long time before five millions of agriculturists in any or all of these states will supply 17 millions with bread.

Naturally the soil of England is not superior, if it is equal to ours; the cause of its superior productiveness, then, is clearly to be traced to an improved state of agriculture. If we can ascertain, therefore, in what these improvements consist, we shall probably gain some hints which may be of essential service to us.

To the increased quantities of manure prepared, and the skill shown in its application; to the rotation of crops, and the general substitution of wheat for the coarser grains; to the introduction of root-culture, and the use of lime and bone-dust, may most of the great productiveness of English lands be ascribed. It is true, some five or six millions of acres, once lying waste and in commons, have been enclosed, and add their product to the sum total; still the very fact that these wastes have been rendered fertile, proves the superior skill of the present race of British agriculturists over those of former days.

There can be no doubt that the quantity of manure made and used on farms in Great Britain is more than double the amount made fifty years since, and probably exceeds in about the same ratio the usual application in this country. In every form, long or rotted, in compost or with lime, all that can be used as manure, is so applied; and, with the exception of Holland, in no country has the science of manuring made such rapid progress as in England. Lime is used in quantities that would astonish an American farmer, and its good effects are perceptible for a great length of time. But the manure which is most relied upon for the production of root-crops, and which, of course, acts a most important part in the English course, is bone-dust, or bones reduced to a powder by breaking and grinding. In this matter of manures, which constitutes the very foundation of all good farming, we are yet in our infancy. If we can manage to get out our straw on our lands,

we imagine we have done much; the idea of making manure by collecting perishing or putrifying matter into masses, or yarding cattle or sheep for this purpose, seems scarcely to have been dreamed of by us. Lime can be had in most sections of our country in abundance, yet, with the exception of a few German settlers in Pennsylvania, few have attempted its use as a dressing for the soil; and as for bone-dust, there are multitudes among our farmers who, we suspect, never heard of the article. Here, then, is an important point of difference between our farming and that of England, and on which we must receive lessons from them, or continue to exchange our dollars for their wheat. We can, and we must, pay more attention to providing and applying manures.

The rotation of crops, a necessary result of the extension of the turnip culture, is another of the causes which has placed the agriculture of England so much in advance of ours. It was formerly the custom to allow land intended for mowing, or, indeed, for pasture, to remain undisturbed for years; the impression prevailing, that, if broken up, it would never again become as valuable for these purposes as before. Enlightened practice, however, showed the incorrectness of this opinion, and lands which had remained in turf for five hundred years or more, were submitted to the plough with the most beneficial results. Roots, wheat, and grass succeeded each other, and the products of the country were, within a few years, nearly doubled. The same prejudice respecting meadow-lands is not yet entirely extinguished in this country; though proofs, which cannot be gainsaid, of the propriety of occasionally ploughing them, has in many instances forced conviction on the farmer, and led to a more philosophical and rational mode of culture.

Several years since, it was asserted in the Edinburgh Review that the introduction of turnip-farming in England had added more than sixty millions

to her products annually. Their culture has since rapidly extended; and the regenerating influence they exert on the soil, and the immense addition to the given products of any district created by them, has excited the attention of every section of that country. To the turnip may be traced the great improvements made in raising cattle and sheep in Britain, as the vast amount of food thus produced from an acre enables the cultivator to enlarge his flocks or herds to any desirable extent, and, by rapid or comparative feeding, to exhibit their several qualities. The discovery of a silver-mine, rich as Potosi, would to England have been poverty itself compared with the wealth flowing in upon the kingdom from that single root, the ruta-baga; and the beneficial effects upon the comfort and happiness of the people are immeasurably greater than could result from any such discovery. In this country we have hardly begun to appreciate the value of the root-crop. Public-spirited and intelligent farmers have endeavoured to bring the subject to the notice of their fellow-tillers of the soil, but deep-rooted prejudices, and a dread of innovation, have in most instances made the effort up-hill work, and, as yet, productive of comparatively little effect. Still the ice has been broken; an impression—a favourable one, we believe—has been made on public sentiment; and when we remember that a long series of years was necessary to place the root-culture on a firm foundation in England, we see no reason to despair of a like triumph over incorrect notions and the production of similar benefits here.

Population, by justifying, or, rather, compelling English farmers to adopt peculiar systems of farming, may be said to create a wider difference between the agriculture of the two countries than any arising from the soil. Owing to what may be termed an immense surplus population, the price of labour is reduced to the lowest possible rate at which

a bare subsistence can be procured: and, in consequence of this, many methods of farming are there adopted, which could not, at the prices of labour and agricultural products, be otherwise than ruinous here. For instance, weeding wheat and other kinds of grain is a very common practice there; and multitudes of women and children earn their bread for a considerable part of the season in this manner. It is clear that this operation cannot be introduced among our farmers, though its effects in keeping the soil clean, and in increasing the amount of the crop, must be evident. Another consequence, too, of the cheapness of labour, is, that many operations are performed by hand, and at a far greater expense of time, which are accomplished by the aid of implements here, and in one fourth of the time.

But it is to climate that the principal points of difference in the agriculture of the two countries must be traced; and this is what should be kept most distinctly in view when comparisons between English agriculture and our own are instituted. England, though in the latitude, and most of it north of Quebec, has a milder climate than our Middle States; and this fact should not be lost sight of in adapting the agriculture of that country to this. In the United States (we speak particularly now of the Northern and Middle states, as it is these that are more influenced by English agriculture than the South), the summers are much hotter and the winters much colder than in England: hence some plants that require a great degree of heat will succeed better here than there; while many plants will bear the winters of England in the open air, that perish when exposed without protection to the intense cold of our winter months. A great number of thermometrical observations show that the average temperature of the three months of January, February, and March in England is about 37°, 42°, and 47°, and that of the three months of June, July, and August about 63°,

66°, and 65°. The average difference between the highest and the lowest temperature per month will not exceed more than six or eight degrees, those sudden and extreme changes to which our climate is subject being unknown there. In the valley of the Genesee, near Lake Ontario, the average for the three winter months gives about 24°, 26°, and 36°, and for the three summer months, 71°, 73°, and 72°; The mean average of several years is 49°, and the range of the thermometer about 100°. In this country we have changes of from 30° to 40° in twenty-four hours: there the greatest rarely exceeds six or eight. There, also, the thermometer seldom descends but a few degrees below the freezing point. while here it is below for weeks or months together. Indeed, it is probable that, in the colder parts of the United States, the thermometer falls below zero as often as it does in England below 32°.

This statement will show that there must be a material difference between the agricultural operations proper to two countries so situated, as far as those operations can be affected by climate. To give a single instance: Indian corn, it is ascertained, cannot be grown in any country where the thermometer for more than one month is not above 70°; and that in a temperature of 75° or 80° it arrives at its greatest perfection. This is the reason why, notwithstanding all the efforts made to introduce corn into Great Britain, it has proved a complete failure. It is not killed with the frost there as here: but the degree of heat will not bring it to maturity during the summer months. Mr. Cobbett was confident he should succeed, and did grow some tolerable crops of early Canadian; but, like some trees which flourish and mature their seeds here, but will not ripen in England, the corn would not in all cases mature so as to vegetate, and, in spite of his boastings, he was compelled to abandon the culture. On the contrary, wheat is a crop that requires a lower temper-

ature than maize, and is not adapted to a hot, dry climate. Great Britain is therefore one of the best wheat countries on the globe, and perhaps produces, in proportion to the land in tillage, a greater amount than any other. The low temperature and moist climate of England is found to agree with this plant perfectly. Scotland is too cold; but no part of the island is too hot, as is the case with a considerable portion of our Southern states.

To this difference of climate must be attributed the difficulty we have found in the United States in growing hedges from such shrubs or trees as are used in England for this purpose. From witnessing their excellent effect and beautiful appearance there, it was perfectly natural that we should adopt the same plants for the same object here; but, after the repeated and persevering efforts of fifty years, it may be questioned whether there are five miles of tolerable hedge, from imported varieties of thorn or holly plants, in the United States. The difference between the moist, temperate, and equable climate of England, and the hot, dry, variable climate of this country, seems to have been overlooked; when a recollection of this fact would have convinced any one acquainted with the physiology of plants that our seasons must be fatal to English hedges. Whether there are any of our native plants that will supply this desideratum, remains to be seen.

The worst effect which our variable climate and intense cold have on our agriculture, when compared with that of England, is their influence on our wheat-crop. Such a thing as winter-killed wheat is scarcely known in that country; while in many parts of this, especially where clay predominates, wheat in all winters is more or less liable to injury, and in some years has more than two thirds perished. The heaving out of the roots of wheat and clover plants by the expansion of frost, and which is here the most fatal in the spring of the year, when

the surface thaws by day and freezes by night, is something which agriculturists in that country are rarely called to guard against, and which, of course, never enters into their calculations in the preparation of their soil. Here it is advisable, in all cases, to guard against the evil by such a system of ploughing and manuring as shall most effectually obviate the danger arising from this source.

In reading or adopting the modes of English farmers in the preparation and application of manure, the influence of climate should not be forgotten. If anything has been established by agricultural chymistry, it is, that all manure loses in value exactly in proportion as the fermentation and decomposition goes on in the open air, by which most of the volatile and finer parts of the manure are lost to plants. In a high temperature, such as that of our summers, yard or stable manure will ferment rapidly; and if left, as it generally is, exposed to the rain and sun, its value and efficiency are much diminished. If piled in large masses, as is practised by some farmers, and then allowed to stand through the summer, a custom followed to some extent in England, it must be remembered that fermentation and decomposition go on here with a rapidity unknown there, a fact depending on the greater heat of our summers; and hence the increased necessity of guarding against the loss of the fertilizing gases thus liberated. The proper place for the decomposition of manure is beneath the surface of the earth; but where it is desirable, as it sometimes may be, to keep it over the summer for fall application, the manure should be piled in layers alternating with earth (and if this is partially combined with lime, so much the better), which will absorb the volatile salts and parts thrown off by decomposition and fermentation, which in our climate must rapidly take place, and the quantity and quality of the manure will be greatly increased over what it would be if left to ferment in the yard,

or where it is simply heaped up without any covering of earth.

It appears, then, that in things relating to the soil alone, its preparation or amelioration, the application of animal or mineral manures, and the artificial arrangement of crops, American farmers may with safety copy the example of the British farmers, and derive important advantage from the perusal of English works on agriculture. So they in general may, in all things relating to the preservation of crops from insects or diseases, such as the grub, cutworm, blight, mildew, wheatworm, &c., as these are common to both countries, and the balance of experience is altogether in favour of Europe. In everything relating to wheat, they are entitled to a hearing above all other men, as in no country is the culture of that valuable grain carried on so successfully ; and this is owing, in a great measure, to the skill and science that have been brought to bear on the production of that crop. In raising cattle, and the common and improved breeds of middling fine-wooled sheep, English farmers are exceeded by none ; and on all these topics they may be considered as qualified to instruct us. *Fine-wooled* sheep, however, notwithstanding the pains taken with them, have never succeeded in England. The imported Merinos from Spain and Saxony have deteriorated and wasted away ; and their place with the English farmer are supplied by the hardier and heavier Leicester and South Down. The immense quantities of fine wools used in the English factories are imported from Germany, France, and Spain ; and hence, in the management and growth of the fine-wooled breeds of sheep, we have little to learn from them. There is no doubt that the production of fine wool is at the present moment far better understood in the Northern states than in Great Britain ; and there are more Saxon and Merino sheep in Vermont and New-Hampshire than in the three kingdoms.

But it is mainly on those points of agriculture where cheapness of labour and the influences of climate can be brought to bear, that we find British agriculture to cease from affording suitable models for us, and are thrown on our own resources of observation and comparison. Because corn cannot be grown in England, this is no reason why the farmers of the United States should not plant it; and, on the other hand, because the whin and the holly make a durable and beautiful fence in England, this furnishes no conclusive proof that the same results will ensue in our country. English farmers use little or no precaution against the winter-killing of wheat, or the destruction of roads by frost; but here such precautions are essentially necessary, and based on reasons respecting which the English farmer knows nothing from experience, and therefore must be illy qualified to instruct.

To the above causes of the advance of English agriculture, and which in themselves afford sufficient reasons why they can sell us bread, must be added the encouragement afforded by the British government to all agricultural enterprises, and the laudable spirit which is created and fostered by agricultural publications among the great landholders and the tillers of the soil. In almost every district are yearly or semi-yearly fairs and cattle-shows; where the finest cattle and the most valuable sheep are exhibited, and their excellences made known to the public; where farmers meet and exchange opinions on the best methods of culture, and discuss the improvements of the age; and where they learn their own importance in the scale of society, gradually lose their prejudices, and acquire habits of thinking and reflection that lead to emulation in farming, and eventually teach them to respect themselves.

We come, then, to the conclusion, that if we would make progress in farming—if we would avail ourselves of the advantages which the God of nature

has bestowed upon us in such profusion—in short, if we would be truly independent, not only in name but in reality, we must profit by the experience of others; and from the improvements made in foreign countries, select such as are adapted to our soil, climate, and habits. It is high time that we ask ourselves the question in earnest, whether we are to become tributary to foreign nations for the necessaries of life? whether, with the finest soils, the most varied climates, the most unlimited sources of production, we are still to be dependant on the bounty, caprice, or self-interest of others? in fine, we should consider which is the most honourable importation for such a nation as ours—knowledge or bread.

CHAPTER III.

STATE OF AGRICULTURE IN THE UNITED STATES.

Its Depressed Condition.—Rate of Production.—Causes of its Depressed Condition.—Means of Improving our Husbandry.

That the agriculture of the United States does not, to use a commercial phrase, rank with that of the most favoured nations, is perhaps generally admitted; that it might, with proper care, be made to do so, does not admit of controversy; and it may be well to inquire into some of the causes that lead to this state of things. With one of the most fertile countries by nature on the face of the globe, we do not, in the amount of our products, equal that of countries far less favoured, but which, by superior skill in cultivation, have attained a fertility unknown among us. As examples of this, we may name England, Belgium, and a portion of Germany; in

which the average crop per acre is much greater than in the United States, if we except, perhaps, some few of the best cultivated districts.

In order to determine what *should be*, it is sometimes useful to ascertain what *actually is*. Estimates have been made at different times of the total of agricultural products in this country. Such estimates, however, have no pretensions to exactness; they are merely approximations to the precise quantity: still, as similar estimates are made in other countries, they may afford the means of comparison, as showing the proportion of production to the population. The year 1838 was, on the whole, a favourable one for the farmer; and the crops undoubtedly, in the aggregate, exceeded those of any previous year. If we estimate the wheat grown in the country that year at sixty millions of bushels, the corn at one hundred millions, and the oats at one hundred and fifty millions, we shall not probably be far from the truth. Barley does not rank high in amount as a cultivated crop, though the quantity produced is annually increasing. The wheat is principally grown in the country north of the Potomac and Ohio, and south of the great lakes. The corn is produced chiefly in the South, and in the valleys of the Ohio and Mississippi. Oats are cultivated in all sections, except in the extreme South; and are everywhere the principal food of horses, while they are given to cattle, sheep, and swine to a considerable extent. The average crop of wheat, on the whole, cannot be estimated per acre at more than eighteen bushels; corn at thirty-five bushels; oats at the same; and barley at about twenty bushels. This rate will, of course, vary greatly in different sections. In the states north of the Ohio, the average of corn would perhaps equal or exceed fifty bushels to the acre, while in the states south of the Potomac it has been estimated as low as fifteen bushels per acre. The difference in the other crops

in the several sections of our country would be less; but still it is considerable.

That these average productions might be greatly increased, does not admit of a question; that the interests of agriculture demand that such should be the case, is equally clear. By attention to the selection of seed and the preparation of the soil, an addition of ten per cent. to these averages might be easily made; experience shows that such is the fact; and a multitude of individual instances might be adduced to prove that this has already been done by skilful and intelligent farmers.

The causes which, in our opinion, have tended more than any others to depress agriculture, and prevent its receiving the attention it demands, as well as to reduce the profits which should reward the labourer, are the following. First, a want of respect in the agricultural interest for their own profession. There is a feeling in certain portions of the community (principally among those who have done nothing to increase the productive capital of the country themselves, and who may be termed the drones of the social compact), that personal labour is disgraceful, and that the cultivator of the soil is little better than a slave. Strange as it may seem, this feeling may be said to be promoted and perpetuated by the conduct of farmers themselves. There are too many men among us—men who have good farms, and who might employ their sons upon them, with the certainty that honourable competence would be the result—who prefer to see them exposed to the fluctuations and uncertainties of mercantile life, or involved in the temptations and perplexities of professional life, rather than honest, high-minded, intelligent cultivators of the soil. For this evil, and it is a serious one, the remedy is with the farmer. His sons should be well educated; but they should be taught to feel, what in fact is the case, that in the actual dignity and usefulness of

their profession, the farmer has few equals and no superior.

The second cause of the depressed state of agriculture in the United States is the inattention of farmers in selecting the best breeds of animals for their yards, and the best seeds for planting. In these two respects there is the greatest room for improvement; and the necessity of entering at once upon a course of reform cannot be too earnestly pressed upon our cultivators. Experience has shown, that animals can be formed, in the hands of the scientific breeder, to meet the wants or remedy the defects of any existing race. Whether it be beauty of form, weight of carcass, aptitude to fatten, or all these combined in cattle; or the same qualities, with or without wool, in sheep; Bakewell, Cully, Berry, and Ellman have shown that domestic animals, in the hands of the farmer who understands the principles of breeding, are as clay in the hands of the potter, to be moulded and transformed at will. The records of Smithfield market (the most decisive evidence that can be produced) prove that the average weight of cattle and sheep has increased one third within less than half a century. Not less beneficial have been the results which have ensued from attention to improved or new varieties of seeds. The most valuable kinds of wheat, barley, oats, and other grain in Europe, and of maize or Indian corn in this country, have been the result of careful selection and long-continued cultivation. Col. Le Conteur, of the Isle of Jersey, who has paid more attention to wheat, and instituted a greater number of experiments in regard to the plant than any other man living, having devoted about twenty years, and ample means, to the pursuit, states, "that the only chances of having pure sorts is to raise them from single grains or single ears; and that the improvements he had made in this way had amply rewarded his labour, as the produce of his crops had been in-

creased from an average of about twenty-three to twenty-five bushels an acre to about thirty-four; and that, since he has raised wheat from single ears or carefully selected sorts, he has increased his crops to between forty and fifty bushels an acre." Many of the best known kinds of wheat, barley, and oats now grown in Europe (and some of them have been successfully introduced into this country), have been produced from single ears or heads of grain, selected by observing men for some valuable qualities they appeared to possess. Such was the origin of the White Kent and Whittingham wheat; the Chevalier, Annat, and Stains barley; and the Potato, Hopetown, and Dun oat. In this country, we need only refer to the justly celebrated Baden corn, which, by persevering selection, has from four ears been brought to produce ten on a stalk; and where the climate and soil are most favourable, as in the Western States, has added at least 50 per cent. to the productiveness of the corn-crop. This is a field of improvement in which every farmer may be a labourer, and with the happiest results. To improve his seeds requires no extra capital; a little care and attention to the qualities of his growing and ripened crops is all that is requisite; and, whether he avail himself of the opportunity for improvement or not, no good farmer can avoid having the feasibility of so doing repeatedly forced upon his observation, by the difference in the size and productiveness of individual plants.

Another and third cause of the low state of agriculture is the too general want of knowledge among farmers of the scientific principles which govern it. That every farmer should be a thorough chymist, and be able to explain all the laws that govern matter, and, in so doing, trace to their source the elements of vegetable and animal nutrition, is not what is to be expected; and so with the kindred sciences of botany and entomology. Still he should

be able, and with very little attention may be able, to go through a sufficiently accurate analysis of soils, and be familiar with many of the minute, as well as the more important changes that matter undergoes in its transformation from inert atoms to organized life. Constantly among plants, and compelled to be familiar with insects, some of both of which he numbers among his worst enemies, he is in part a botanist and entomologist by necessity; and, were his observations properly directed, there is nothing to prevent, but much to make farmers the most successful discoverers in these sciences. Works which would give a proper course to his inquiries may be found at almost every bookstore; and it is not too much to hope, that volumes will be found in every common school and district library, to awaken inquiry and direct observers in the successful pursuit of these and other sciences.* We think that blame may be attached, in a greater or less degree, to most of the agricultural publications and periodicals of the day, in not devoting more of their pages to the discussion and elucidation of these topics. It may perhaps be said, that but little is yet known with certainty on these subjects; that chymical analysis, vegetable physiology, and the development of the laws that govern the nutrition of plants and animals, are all as yet in their infancy: still it cannot but be useful to have what actually is known spread before the public; and even if much that is supposed to be certain should hereafter prove merely theoretical, useful observations will be elicited, and truth the more readily establish-

* In the second series of Harpers' School District Library are embraced the following important works relating to agriculture: Farmers' Instructer, in two vols., by Judge Buel; a Treatise on Agriculture and Horticulture, by Gen. Armstrong; Chaptal's Chymistry applied to Agriculture, with the most valuable part of Davy on the same subject; and a volume entitled Food for Man, giving a particular account of the most useful and important grains, roots, fruits, &c.

ed. Agriculture is strictly a science, and should be considered as such. The principles that govern and control matter are many of them already understood; and no one has any pretensions to the title of a thorough farmer who is not able to apply such as are known to his course of practice in the field. Many men express surprise at the well-known fact, that the most skilful and successful farmers we have in the country are men who have been bred to other pursuits, and never had the management of a farm till they purchased one for themselves, and assumed the business of the farmer without any previous experience. We think there is nothing surprising in this result. These men brought to the business of agriculture that fund of knowledge they had already acquired, and which, unfettered by long-established modes and habits, they were at liberty to apply directly to their new pursuit. They had no deep-rooted prejudices in favour of unscientific methods of cultivation to shake off—methods which too many farmers venerate, simply because they were followed by their fathers; and hence they were prepared to adopt the best courses, and to follow the paths that scientific research has demonstrated must lead to success.

Another, and, we are inclined to think, more active cause in retarding the progress of agriculture in this country than any we have mentioned, is to be found in the too great diffusion of agricultural capital and labour; or, in other words, we cultivate too much land to do it well. The desire of great farms is a striking trait of American farmers. As fast as they acquire capital, they spend it in purchasing more land. When there is no longer any adjoining theirs to be purchased, they go to the wide West, and expend their hundreds or thousands in buying prairie sections, or "corner lots" in some of the future cities promised in that broad region. They may be making money by this process; they

may be acquiring wealth for their children to differ about; but, nine times out of ten, their system of agriculture is barbarous, their method of living scandalous, and their farms the very reverse of neatness and order. We cannot expect that a man who does this will spend his capital in beautifying and putting his farm in order; in planting, and draining, and repairing, when such expenditures will not repay him more than seven per cent., whereas by purchasing more, or new lands, there is a probability that 30 or 50 may be realized. It requires too great an effort of self-denial to see our neighbours enlarging their domains to the size of a German principality, and to be content with some two or four hundred acres. We have, as a body of farmers, yet to learn that the products of a small farm, in proportion to the capital invested, are usually greater than those of large farms. We have yet to acquire a taste for small, neat, well-finished, and well-furnished houses, in preference to the enormous "shingle palaces" which we take such a delight in erecting; and when shall we learn that a few acres, well-fenced, kept clean of weeds, and growing richer and more productive every year, are better than many acres with the fences rotted or thrown down, the fields and crops choked with weeds, and the soil, from the wretched course of cultivation, annually deteriorating in value and productiveness? It is a very poor plan in farmers to wear out and impoverish what land they have because they can buy more; better raise a few acres to the height of fertility, place it in perfect order, and then, if there is any surplus capital, after attending to the moral and intellectual wants of the family, it may be profitably expended in more lands, to be gradually brought to the same state.

Such are some of the most prominent causes that, in our estimation, have contributed to place agriculture where it now is: not as bad, it is true, as it was some twenty-five years since, but still very far from

what it might be, and what it would be if farmers would awake to their true interests. We cannot blame the German peasant or the Russian serf for sending to us their surplus grain: they would never do it if we supplied the market with that produced at home, as we easily might. It is useless to complain of Legislatures, because they do not attend to the wishes of farmers in establishing agricultural schools and societies. The remedy for these things is in our own hands. To shut out foreign grain, we must supply the country with our own; and we shall find it far better to export than to import. If our legislative servants misunderstand or disregard our wishes, farmers have only to make it known that they are *emphatically the people*, and their voices will be heard and obeyed. More than any other class, farmers hold their destiny in their own hands; they should carefully study the causes of the changes that come over their business, or which permanently depress it, and, thus understanding them, they will be able to prevent or avoid such results. There is no more certain criterion by which to judge of the state of any people, physically and intellectually, than the condition of their farms, and the taste displayed in their buildings and gardens, and in their public improvements.

CHAPTER IV.

COMPOSITION OF SOILS AND THEIR ACTION.

Arable Soils.—Proper Proportions.—Productiveness.—Tendency to Deteriorate.—Necessity of Manures.—Value of a Rotation in Cropping.—Reasons for the Practice.

A KNOWLEDGE of the earths that enter into the composition of, and which most essentially modify the soil he cultivates, is necessary to every farmer; as such knowledge greatly facilitates its proper management, in the crop to be raised, the manure to be applied, and the time of its application. Fortunately for the farmer, the kinds of earth that form the best soils for cultivation are few in number, three being sufficient for every valuable object, and more being frequently found injurious rather than beneficial to the purposes of the agriculturist. These three earths are *silex*, which is the basis of all sand, and is found pure in rock crystal; *lime*, which is the basis of all the limestone rocks, marbles, and gypsum, and is found nearly pure in Iceland spar and primitive marble; and *alumine*, which is the base of all clayey soils and the great variety of clay rocks, and is found nearly pure in the best specimens of the alum of commerce.

Of these three substances, soils devoted to agriculture are nearly always formed, though they exist in very different proportions, and are always more or less mingled with decomposed animal or vegetable matter. Vegetation will indeed take place in any one of these substances, if water and the proper degree of warmth be present, but it will be very feeble and inefficient. On the contrary, when combined in proper proportions, and the necessary quan-

tity of decayed animal or vegetable matter is present, the growth of plants will be vigorous, and their perfection, if not obstructed by other causes, certain.

To ascertain the proper proportion of silica, lime, and alumina that must be united to form the best soils, chymists have very naturally resorted to an analysis of the earths of those countries and those particular places most celebrated for the quantity and quality of their products. These examinations have been made by different individuals; but the general results agree so nearly as to inspire much greater confidence in their accuracy than if they were discordant and contradictory. To show the composition of some of the best arable soils, the quantity of sand, lime, and clay, as well as the nature of the other substances combined in such lands, we have selected some instances of analysis from the best authorities on the subject.*

Bergmann found that one of the most fertile soils in Sweden contained in 100 parts:

Coarse Silex	30 parts.	Alumina	14 parts.
Silica	26 "	Carbonate of Lime	30 "

In a specimen analyzed by Giobert of Turin, these three earths were in the following proportions:

Silica	77 to 79 parts.
Alumina	9 — 14 "
Lime	5 — 12 "

An excellent soil for wheat in the county of Middlesex, England, gave the following proportions of these principal earths, finely divided:

Carbonate of Lime	28 parts.
Silica	32 "
Alumina	28 "
Animal and Vegetable matter	11 "

Count Chaptal analyzed a very fertile alluvion on the Loire, 375 miles from its source, and found it composed of

* See Chaptal's Chymistry applied to Agriculture, p. 116, Harpers' edition.

Silicious gravel	32 parts.	Carbonate of Lime	19 parts.
Calcareous gravel	11 "	Alumina	21 "
Silica	10 "	Vegetable remains	7 "

A specimen of soil from Touraine, celebrated for the production of hemp, gave of

Coarse gravel	49 parts.	Silica	17 parts.
Carbonate of Lime	25 "	Alumina	16 "

In nearly all cultivated soils in good tilth, the quantity of animal and vegetable matter is nearly the same, or about one tenth of the whole. These examples, and a great number of examinations of soil by Davy, Bergmann, and Chaptal, show about the same result, and exhibit conclusively the proportions in which these three principal earths, lime, clay, and sand, should be mixed, in order to produce the best soils for cultivation. Where this is well understood, a following out of the principles here laid down in bringing the soil, by a proper mixture of these earths, to a right proportion, will ensure a quality of soil of the best and most valuable kind. If either of these earths exist in too great proportions, the land will be comparatively poor, and its power of vegetation diminished.

For instance, if land is found to contain too much calcareous matter (a very rare fault, however, by-the-way), the difficulty is to be remedied most effectually by an application of argillaceous or clayey marl, a substance principally composed of clay and sand. Land which contains too much silex will be benefited by the application of calcareous marl, or marl composed of lime, clay, and sand; while soils in which clay predominates need the addition of sand and gravel; if calcareous gravel or sand, so much the better. In soils where but one of these earths is present, there can be little or no vegetation, and their fertility increases exactly in proportion to their proper mixture.

In an arable soil it is necessary, whatever may be its constituents, that it should not be too fine. In

the language of Chaptal, good soils "have a constant tendency to become pulverized, and at length, by frequent tilling, by the action of salts, manures, and frosts, they are reduced to so fine a powder as to cease to be productive. Rain falling upon ground in this impalpable state renders it perfect mud, which, when exposed to heat, becomes so hard that the air cannot penetrate it, nor the tender fibres of plants force their way into it;" and Davy has observed, that all soils composed of nineteen twentieths of impalpable matter are completely barren. Barnyard manure will correct this state of things only for a short time; the complete remedy is the application of sand and gravel, which restores it to fertility.

Soils are the most liable to become dry and hard in which alumina predominates; and as a considerable part of Western New-York is based on clay slate, which, when uncovered to the air, and exposed to the action of rain and frost, speedily falls to powder, of which the base is alumina, there is a continual tendency in such soils to decrease in fertility, a tendency which the application of manure alone is not able to counteract. Here the remedy is plain, and the addition of a proper quantity of sand would be an effectual barrier to consolidation. It is on account of this tendency in aluminous soils to consolidate that we so frequently hear farmers who cultivate lands inclining to clay, complain that their wheat freezes out much more than it formerly did. Lands in which silicious or calcareous matter abounds rarely suffer in this way; as, where these substances exist, sand and gravel are in sufficient quantities to prevent consolidation. If such soils suffer, it is from the want of alumina, which leaves them too porous to retain moisture or to receive the full benefit of manures.

Where earth is composed of clay and fine sand, if the former amounts to one half or more, it is fit for

brick or earthenware, but not for cultivation; and where the alumina amounts to forty parts in a hundred, it has the effect of rendering the soil so steril as to be unfit for agriculture. A great variety of experiments were made by Tillet of Paris, in the formation of artificial soils, and he found that the alumina, if it greatly exceeded the other ingredients, had a very unfavourable effect. The most fertile mixture produced was composed of sand or silica 46 parts, alumina 16 parts, and carbonate of lime 37 parts.

It would be reasonable to expect that these three earths, so essential to the productiveness of soils, should enter largely into the formation of vegetables grown upon them. That such is the fact has been abundantly proved by the experiments of Bergmann and Ruckert; and, what is more curious still, these substances are found, with few exceptions, in about the same proportions in which they exist in the best natural soils. In the analysis of different plants and seeds by these chymists, it was found that 100 parts of ashes, obtained from the following substances, well leached, and, consequently, freed from all their soils and soluble matter, yielded in

	Silica,	Lime,	and Alumina.
Ashes of wheat	48	37	15
" oats	68	26	6
" barley	69	16	15
" rye	63	21	16
" potatoes	4	66	30
" red clover	37	33	30

These facts in relation to soils and their productions are of great consequence to the farmer; and, if borne in mind, would not only greatly assist the purchaser of farms in making good selections, but also materially aid the cultivator in ameliorating and improving such lands as are already subjected to culture. Nothing, scarcely, is more easy than to ascertain whether sand, or clay, or lime preponderates in a soil; and whether the circumstances of

strata and position are such that the increase or diminution of one or the other may be confidently expected from the effects of time or the process of cultivation.

The analysis of soils has hitherto made little progress in this country, and farmers, in general, know little of the soils they cultivate, and of the reasons why some are fertile and the others steril, when in general appearance they are much the same. We think we are justified in expecting much in this part of chymical agriculture from the contemplated survey of the state, as it is one which can scarcely fail to claim the attention of the scientific men to whom this survey is confided. The farmer cannot too thoroughly understand the nature of the soil he cultivates, and any measures which shall facilitate the acquisition of the desired knowledge should be hailed with general satisfaction.

TENDENCY OF SOILS TO DETERIORATE.

The natural, the inevitable tendency of all cultivation is deterioration of the soil. The richest and most fertile soils contain but a certain proportion of matter fit for the purposes of vegetation, and every crop taken from them sensibly lessens this quantity. The result, therefore, must be, that continual cropping will reduce the best soils to barrenness, until, where circumstances admit, nature, by her gradual method of repairing wrongs, again imparts a degree of fertility. It is, however, possible to counteract this tendency to sterility in soils; to prevent the exhaustion of the qualities necessary to support vegetable life; and the difference between good and bad farming, or proper and improper cultivation, may be determined mainly by a reference to this single result.

In this country we can hardly form a correct idea from anything around us of the frightful barrenness to which fertile soils may be reduced by improper

management. Cultivation is here so young, that, had it been of the worst description, it would scarcely have been possible so soon to exhaust the treasures that have for centuries been accumulating in our soils. Still there are examples in the United States where soils have nearly reached that point from which a restoration to fertility is impracticable. Soils of a silicious nature, or that are inclining to sand, are the most easily and quickly reduced. Of this the southeast part of Massachusetts, and parts of the Southern States at the present time, and parts of Long Island as they were some thirty years ago, furnish striking proof. When cultivated without regard to consequences, the nutritive part of such soils is quickly exhausted; the little vegetation produced is not sufficient to prevent the burning effect of the sun; the roots of the grasses are unable to fix and bind the soil; it becomes loose and floating; plants root themselves with more and more difficulty; and at last, what was once a fertile plain becomes a sandy waste, where cultivation is impossible.

It is in the Old World that this process of deterioration may be the most clearly traced. To renovate seems to have formed no part of the ancient profession of agriculture. In all the writings of antiquity, there is scarcely a hint that manuring, or improving cultivated lands in any way, was practised to any extent. Now and then, where nature had set the example of imparting fertility by the annual overflow of rivers, man seemed inclined so far to imitate her works, and irrigation for ameliorating land was frequently adopted. But this was about the extent of ancient attempts at improved cultivation, and the result has been such as might confidently have been predicted. The regions of the East, that, two or three thousand years since, were as the Garden of Eden for beauty and fertility, have gradually become steril and worthless; and tracts of country that once

supported a thriving and industrious population have, from the action of the causes above alluded to, become deserts, in which the solitary camel can scarce find a shadow of vegetation to supply his easily-satisfied wants. Mesopotamia, parts of Syria and Palestine, Edom, and parts of Arabia Felix, many parts of the north of Africa, and no inconsiderable portion of Asia Minor, have thus been rendered hopelessly barren. The finest of wheat can now no longer be grown on the plains where once the reaper filled his arms with the yellow sheaves. They were ceaselessly cropped until the soil was so exhausted that the unaided efforts of nature were unable to restore fertility, and the result is perpetual barrenness.

To counteract this tendency to sterility is the business of the farmer; and on the possibility of doing this rests the whole system of improved agriculture. Science has here come to the aid of the cultivator of the soil, and, by revealing the agents and promoters of fertility, has greatly assisted and simplified the processes, without which all would be still doubtful and uncertain. The action of manures has been ascertained; the value and activity of the various salts formed by the decomposition of animal and vegetable matter in part determined; the aid which the mineral earths afford to vegetation has been carefully examined; and those combinations of soil the best calculated to induce fertility have been accurately investigated. It has been shown, that to take from the soil without making corresponding returns is suicidal policy; and that, if this point is properly attended to, land can be cropped without danger of deterioration.

Manure, then, is the sheet-anchor of the farmer. It is to this source of fertility he must look for the renovation of the soil and the means of continued productiveness. And it is on manures produced from his own fields, from his herds and his flocks,

from decayed vegetable and animal matter, that he must depend for this result. These are the true fertilizing ingredients; and, though other agents may be useful in exciting them to action, these must be considered as constituting the food of plants, as the cause of growth and nutrition. The application of the exciting mineral manures, such as lime and gypsum, is productive of the happiest effects, for the reason assigned above; yet they are not so absolutely essential to the improvement of the soil as those of a vegetable or animal origin. Matter which has once lived, which has already taken the forms of organized existence, more readily assumes again the forms of organic life, and is more easily assimilated by the organs of plants than that which has never undergone such a change. It is the office of the vegetable to take the crude atoms of matter as they exist in the soil, and prepare them for the support of vegetable life; and when this has once been done, though a partial decomposition may have been effected, a renewal of the process is comparatively easy and certain.

In connexion with the preparation and application of manures, the next most important step which modern agriculture has taken to prevent a deterioration of the soil is rotation in crops. Judiciously conducted, the result is certain; exhausted lands are restored, and the profits of the agriculturist greatly increased. It was formerly the custom to let lands adapted to grass remain for that purpose alone; while those suitable for the plough were annually subjected to its use until exhaustion forbid. They were then left to the restoring processes of nature. There were, at the beginning of this century, lands in the farming sections of England which it was well known had lain in grass for five hundred years; and there were other tracts which had been as constantly submitted to the plough, or, at least, as often as the soil promised to repay the expense of cultiva-

tion. This plan has been abandoned; a more enlightened system of agriculture has succeeded; and agricultural products have in consequence been more than doubled. The course of rotation is, indeed, variable in different districts, both in Europe and in this country, but it is founded on the same great principle—that different plants take up different ingredients from the same soil and from different depths, and that a new plant will flourish in a soil where one of the same kind, previously cultivated, could not succeed at all. Thus in England, in Holland and Belgium, in some parts of Germany and France, and, in some few instances, in this country, a regular course of cropping, suited to the soil, has been adopted with the happiest effect. This course, which varies from three to six years, according to circumstances, embraces roots, grains, and grasses; and, taken in connexion with thorough manuring, which this system enables the farmer to practise, it not only improves the quantity and value of each kind of crop, but deepens, enriches, and fertilizes the soil. Manure and the rotation of crops are, then, the great means to which we must look to preserve our now fertile plains from the fate which has overtaken so large a part of the East; and they are fortunately both easy of application and entirely within our reach.

ROTATION OF CROPS.

The necessity of a rotation of crops is founded on a few simple principles, the force of which, and their application, any one may understand. They have been very clearly and concisely stated by Chaptal,* and they are so fundamentally important to a correct course of farming, that they should be impressed on the mind of every tiller of the soil. They will, of course, bear repetition.

* See p. 334, *et seq.*, Chaptal's Chymistry applied to Agriculture, Harpers' edition.

Principle 1. All plants exhaust the soil.
" 2. All plants do dot exhaust the soil equally.
" 3. Plants of different kinds do not exhaust a soil in the same manner.
" 4. All plants do not restore to the soil the same quantity or quality of manure.
" 5. All plants do not foul the soil equally.

From these established principles, the following are legitimate inferences. First. No soil can nourish a long-continued succession of crops without exhaustion. There would seem to be no exceptions to this, unless the case of river alluvion, such as that of the Genesee Flats, for example, may be considered such. But in this case the annual overflowing, either entire or partially, renews the deposite of fertile matter; or the water, by permeating the soil, divests it of any injurious principles it may have received from previous crops. The position may therefore be considered sound; and the man who crops continually, without making corresponding returns to the soil, will experience its truth in the rapid decrease of his crops grown on such land.

Another inference, and the second, is, that while one kind of crop exhausts the soil by drawing most of its nourishment direct from the earth, and returning nothing of consequence to it, other kinds, deriving a large part of their nourishment from the atmosphere, and returning to the earth much vegetable matter, exhaust it scarcely any, if at all. To illustrate this, let us take grains and clover, or grains and roots with large tops, such as the beet, ruta-baga, &c. The cultivation of the white grains, such as wheat, &c., probably wear out land as rapidly as any crop the farmers of the North can cultivate. This, in part, may be attributed to the ripening of the seeds; but more, we think, to the plants deriving a large part of their nutriment from the earth, and but little from other sources; while, at the same time, the return they make of vegetable matter is the smallest possible quantity. Clover would seem to obtain

its nourishment in a different manner; the matter which forms its roots appears to have been elaborated in its rich and succulent herbage, and it is on the leaves of plants that the atmosphere produces its greatest effects.

The third inference is, that plants which draw their nourishment from the earth, and those that are most influenced by atmospheric causes, should alternate with each other; and that plants that draw their nourishment from the surface should be succeeded by those that seek their food at greater depths. Here is the reason, and a sufficient one it is, why roots should constitute a more important part of the system of American Husbandry. The grains are fibrous-rooted, and spread themselves principally near the surface; the tap-rooted plants, such as clover, turnips, &c., go deeper; and while their luxuriant leaves are employed in aërating their juices, their roots are penetrating the earth beyond the reach of the fibrous class.

A fourth inference is, that a succession of plants of the same species, when possible, should be avoided, as continued cultivation has a tendency to increase the enemies of that particular plant, and a rotation or change would tend to prevent such increase. Owing to the sowing of seed without preparation or precaution, the Hessian-fly, in some districts in England and on Long Island, became so numerous as nearly to destroy the wheat-crop. It was, in consequence, mostly abandoned for a few years in such places, and the insect, lacking its proper nidus for propagation, soon disappeared. Such has been the case with the pea-bug. This bug had so multiplied in some parts of the western district that the pea was almost worthless, and the culture was generally discontinued. A few years has elapsed, and they are again coming into use as a field-crop, and the bug is scarcely known, or certainly not to any injurious extent. A brewer at Newburyport, in Massachu-

setts, a few years since imported some barley from Holland, and some of it was used for seed by farmers in the vicinity. It was infested by an insect which spread rapidly, and compelled the farmers to abandon barley as a crop for two or three years. The insect is now extinct, and barley is again cultivated with success.

A fifth inference is, that crops liable to be infested with peculiar weeds should not be cultivated in succession, but by a rotation should be exposed to a culture that will eradicate them. The culture of corn and roots that require repeated hoeings is found effectual in destroying many weeds that get a foothold in grass-lands, and by seeding lands in rotation exhaustion is prevented, and the soil kept clean, in good tilth, and prepared for any valuable crop required to be grown upon it. Pernicious weeds oftener obtain a foothold with the grains than with any other crop, as these shade the ground but little, and afford a chance for vegetation about their stems which thick-growing or large-leaved plants do not. Farmers find that charlock and redroot are thus disseminated in their wheat-fields, and that a rotation of crops is necessary to clear them of these pestiferous intruders.

Another important inducement to a rotation of crops, but one which is often overlooked in considering the matter, is the greater advantages that can be derived from manure where this system is pursued than where it is not. Every farmer is aware of the fact that there is a wide difference among cultivated plants as to the effect produced by the application of manures. Some can scarcely receive too much, or have it furnished too directly. They are gross feeders, and appear to devour the elements of nutrition without stint or injury. Corn, and the roots generally, are of this class. Others seem to be more delicate, and are either destroyed outright by too large quantities of unfermented manures, or

are excited to such a growth of straw, that the juices intended to form the seed are swallowed up and lost in the mass, and a half-filled, worthless kernel, and lodged, half-rotted straw, is the result. A rotation of crops enables the farmer to shun such disasters. He can apply his fresh manures to crops that require them, and will be decidedly benefited by them; and when the fermentation is over and the decomposition complete, then the grains which require such manures are sown, and reap the full benefit. There can be no reasonable doubt that much of the efficiency of manure is lost by allowing the decomposition to take place on the surface of the earth or in the barnyard; and some experiments would seem to show, that the loss in this way of treating manure is precisely equal to the quantity of nutriment afforded by it to a corn or root crop while it is undergoing decomposition in the earth.

Different soils require a different rotation of crops; and the time required to complete the course mainly depends on the richness of the soil. The most simple and short alternation of crops has been adopted by many of our farmers—that of wheat and clover alone; or one by which a wheat-crop is grown every other year. Clover seeds are sown on the wheat, the ground is pastured in the fall, plastered in the spring, fed through the summer, or mown, and then turned under for wheat. Whether this forcing course (for it can be considered as nothing else) will eventually be found the most profitable, we much question: a course admitting of greater variety, and of longer duration, would be in our opinion preferable. Roots or corn manured; wheat or barley with seeds; grass or clover, fed or mown for two or three years, would perhaps be better on wheat soils where due regard was had to durable excellence of soil as well as present profit.

A suitable rotation of crops has a tendency to keep up the increase of cattle and sheep, a part of

farming very apt to be neglected where the culture of grain is the exclusive object. Perhaps there is no agricultural maxim more true than the Flemish one: No food, no cattle; no cattle, no manure; no manure, no grain; and when it is remembered that without manures there can be no permanent fertility to the soil, the advantage of such a course is not perhaps overstated.

Since the experiments of Dombasle, Dutrochet, and Macaire have given some plausibility to the opinion that plants secrete and deposite substances injurious to succeeding crops of the same kind, the attention of foreign agriculturists has been directed to the preventing such succession of the same plant on the same soil as far as practicable. A writer in a late British Farmer's Magazine recommends the following course as suitable on a dry soil, good for wheat, and on which turnips can be fed off by sheep.

"1st. Turnips: on half the land prepared for this crop, sow white and red (common or globe), and on the other half ruta-baga, manured with bone-dust, rape-cake, or dung; the latter applied in a coarse state, ploughed in and well incorporated with the soil by the last ploughings in preparing the fallow. 2d crop, barley, half Chevalier and half American. 3d crop, seeds, half red clover, with a mixture of rye grass, and half Italian rye grass: manure the young seeds, cut the first crop for hay, and feed the second. 4th crop, wheat: sow different varieties, such as the Chevalier prolific, ten-rowed prolific, and golden drop. Go through the same course again, except putting on dung where bone-dust and rape-cake was before applied; ruta-baga where the turnips, common and globe, were grown; changing the Chevalier for American barley; changing the grasses in the same way; and substituting another variety of wheat where the former grew. The above is a four-year course, yet the same varieties of grain cannot be grown on the same land oftener than once

in eight years. It would be good policy to have a few acres in mangold-wurzel on a portion of the fallow land, instead of turnips, to guard against a scarcity of food in the spring; this root is also very valuable in the lambing season for ewes, as it forces a great quantity of milk."

The changing of one *variety* of wheat for another is, we imagine, of little consequence; but not so the substitution of the fibrous-rooted for the tap-rooted plants, or barley, wheat, and the grasses in succession. If the doctrine of the deposition of noxious matter be correct, it must have reference more to species than variety, and it should be to change in this respect that the attention should be principally directed. But, whether this doctrine be true or false, the reasons for a rotation of crops are untouched; and we are confident that no farmer who views his interests in their true light will discard the system, or, for the sake of a dubious present profit, put at hazard the certainty of permanent productiveness in his soils.

CHAPTER V.

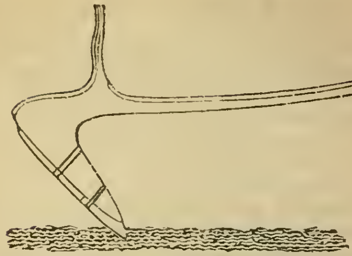
PLOUGHS AND PLOUGHING.

Ancient Ploughs.—Modern Ploughs.—Ploughing.—Depth to which Roots of Plants Penetrate.—Subsoil Ploughs.—Fall Ploughing.—Deep or Shallow Ploughing.

Perhaps the progress of civilization and the advances of agriculture are more clearly marked by the history of the plough and its improvement than in any other way: certain it is, that the state of agriculture in any country can now be ascertained al-

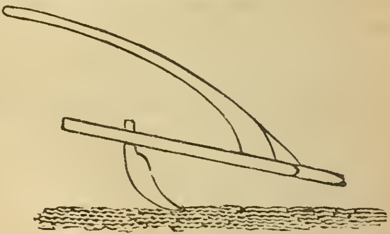
most at a glance, by surveying the implements by which its husbandry is carried on. If the ploughs are ill formed, clumsy, and oldfashioned; if the processes of farming are conducted on the same principles, and by the same means and methods which have characterized them for centuries, the fact may speak well for the stability of the habits of a people, but very little for their intelligence, spirit of inquiry, or public spirit. It may indeed be asserted, that the history of the plough is the history of agriculture, and, as the necessary consequence, of civilization; in which view this implement of the farmer assumes an importance in the eyes of many that it would not otherwise possess.

Nothing can be more simple than the most ancient specimens of the plough; and as, in some parts of the East, a thousand years passes with as little impression on the manners, customs, and implements of the inhabitants as on their temples or their pyramids, or, rather, with much less show of change, we may reasonably suppose that the primitive plough, such as was first used for tilling the ground, may still be found in the East. The earliest figure of the plough may be seen on the images of Osiris, the god of the Egyptians, and it was formed of a part of a tree, the principal stem constituting the beam by which it was drawn, while a main branch, cut to the proper length and point, formed the part that moved the ground. To this point was sometimes secured a sharp stone or a small plate of iron; and this, drawn by a team of heifers, or an ass and a heifer, and not unfrequently by men, constituted the plough of the ancients. The following is a representation of one of these ploughs, long before the Exodus, the point shod with stone or iron, and a branch erect for a handle.



A plough on the same general principles is now used by the Arabs and the Moors of North Africa, one of which is figured in Riley's narrative, and offers a curious illustration of the unchanging nature of things in the East.

Among the implements of agriculture enumerated by Hesiod (900 years before Christ) are ploughs and carts. The plough, from his description, must have been much like the following representation of one used in Egypt, and at a later period in the south of France. It consisted of three parts, the beam, handle, and share. Hesiod directs the beam to be made of oak, and the other parts of elm, and they were fastened with nails.



This, it will be seen, is clearly an improvement on the other, both in the convenience of handling

and as an implement for moving the earth. Its effects, however, could not have been much greater than that produced by the single share or foot of the modern cultivator, and would be useless except on soils partially mellowed by digging. Indeed, all the early ploughs were adapted to a warm climate and sandy soil, where no turf ever formed, nor vegetable fibre or roots bound the earth. No implement has yet been discovered among the ancient tools of the tiller of the soil, which would stand for a moment the power exerted by the modern plough, or break up what we term a greensward. In countries where the grasses formed a turf, the sward was cut and turned by the spade and hand, as is clear from ancient representations of agriculture; and when once the ground had been broken up, it was kept under a course of cropping until completely exhausted, when another piece was subjected to the same process, and the former left to recruit itself by the slow operation of unassisted nature. To the improved plough alone do we owe the modern system of rotation in the cultivation of the soil, a system which has increased the productions of the earth and the means of subsistence a hundred fold.

Perhaps in no part of the world that has any pretensions to civilization, are the implements of agriculture and the processes of farming so rude as in some parts of Poland. A traveller in that country says, "We have seen lands ploughed (after their

manner) by one cow tied by the horns to the trunk of a young fir-tree, one of the roots sharpened and acting as a share, and the other serving the ploughman as a handle." The preceding is a representation of what these wretched peasants in some places call a plough.

The straight stick that serves for a yoke is tied to the horns of cows, and the marks in the soil made by this wooden implement are termed ploughing. It is not a little mortifying, that grain raised on soils cultivated in this manner, and by these half-civilized boors, should have been brought from Dantzic last year* to give bread to us Americans, with our fertile soil and improved implements of farming.

Such were the ploughs in the infancy of agriculture; and such they still are in all places where improvement has been shut out, where the mechanical arts are unknown, and where the intellectual condition of the great mass shows they have not as yet advanced beyond the dawn of civilization. The plough of the modern peasant of Italy is but a shade better than that used by the Arab on the plains of Northern Africa; and the one which serves the boor of Finland and Bothnia is scarcely advanced in mechanical structure beyond that which was used by the "men of Thebes or Memphis." The plough of England and America, in its improved form, is probably the most perfect implement used in the process of agriculture, and there is no one that has done so much to lessen the severity of labour in moving the earth, and rendering it productive of the various vegetables necessary to subsistence. Figures in this case are not necessary, as every farmer knows the difference in execution between a good plough and a poor one, and their construction has been reduced to a more complete system than that, perhaps, of any other implement.

* 1838–9.

The principal varieties of the modern plough are the kinds called the Swing-plough, the Wheel-plough, and the Turn-wrest plough. To the first kind belong all those in common use in this country and in England. In the latter, the kind called the Scotch plough, improved by Mr. Small, and sometimes called by his name, is the most approved. It is now usually made wholly of iron. Those that have been imported into this country, or made on a similar plan here, have not met with as favourable a reception from our farmers as, from their reputation at home, they would seem to deserve. There are several ploughs constructed in this country of wood and cast iron, which are preferred as being less weighty and clumsy, quite as easy and good in working, and procured at a much less expense. It must be admitted, however, that too many of the ploughs used in this country are very imperfectly made, and have the leading characteristics of Pindar's razors—of being made to sell. An implement of such essential service to the farmer as the plough should always be well made on scientific principles; and lightness should, as far as possible, be combined with strength in their construction.

The *Wheel-plough* has been but little used in the United States. It may occasionally be seen on the Dutch and German farms on the rich intervales of the Mohawk. Wheel-ploughs require but little skill on the part of the ploughman, the depth and width of the furrow being adjusted by the wheels; but they are of necessity heavier, more expensive, easier clogged and put out of order, and require a stronger team than the common plough. They have been introduced into the Western States, and must be invaluable on the immense river-bottoms and fertile prairies of the West. A traveller in that region asserts that he has seen a Western farmer at work on his magnificent prairie of hundreds of acres, riding at his leisure on his two-wheeled plough, drawn by

a strong and beautiful team, and practising Mayer beer's sonnatas on his violin, while, without care or effort on his part, the ploughing was done in the very best manner. We confess this mode of riding while ploughing would agree far better with our ideas of comfort than that practised by the peasant on the plains of Rome and Naples, who uses a plough, the head of which is a plank pointed with iron, awkwardly connected with a crooked beam, to which a yoke of wild-looking, half-broken oxen are attached by thongs of rawhide. On this plank the ploughman stands, and, by shifting his position, regulates, in a great degree, the depth to which the earth is moved.

Turn-wrest ploughs admit of having the mould-board removed from one side to the other at the end of the furrow, so that the earth may always be thrown one way. They are similar in construction and effect to what we term side-hill ploughs, and which are so valuable in some situations. There are other places, too, in which such a plough operates admirably; and it is probable much labour would be saved were such ploughs more frequent.

One of the most striking differences between ploughing in England and in the United States is in the strength of team required to perform the same labour. Mr. M'Cullough, in his statistical notices of the British Empire, says, "Perhaps the imperfect construction of the majority of the English ploughs, their great weight, and the extensive employment of those with wheels, may be one cause why, in England, a greater number of horses than are necessary are employed in them. If we except the counties of Norfolk, Suffolk, and Essex in the south of England, and those of Northumberland, Cumberland, Durham, and Westmoreland in the north, there is none, perhaps, in which more than two horses will not be seen in a plough. In some counties, teams of three, four, and, very frequently, five horses, are employed in the tillage of the lightest soils; and on

heavy soils a still greater number are sometimes made use of. Thus, in the Vale of Gloucester, seven horses may be seen attached to one plough. Notwithstanding this excess of horses, the furrow is seldom above four inches deep on light, and six inches on heavy soils, nor is there generally more than three fourths of an acre ploughed in a day. Of course, where there are more than three horses, a driver as well as ploughman is necessary. The horses are almost invariably yoked in line; so that, when the fields are small, and the turnings consequently numerous, most part of the work is done by two, or, rather, by one horse." The Duke of Bedford attempted to introduce ploughing with the teams abreast, as practised in this country, and arranged the horses for this purpose with his own hands; but the ploughman could not, for a long time, be induced to adopt the improvement, preferring to use three, or even five in a string to two or four in pairs.

The difference in the amount of products between land thoroughly tilled and that which has only undergone an apology for tillage, must, at times, have arrested the attention of the most careless farmer. Land adequately manured, deeply and finely ploughed, and properly seeded, can alone be relied on as a source of profit to the cultivator; yet how few are the farms around us where these indispensable requisites are carried out to their full and proper extent. The earth is barely skimmed in ploughing; what sailors call a wide birth is given to the stones and stumps; the seed is put on unequally and sparingly, and then the farmer affects to wonder his crop is no better. We do not conduct our business as we know it should be done; we undertake more than can be performed well; our manure is not applied to the proper crops; and in these various ways nearly one half our labour may be said to be lost.

The garden is that part of the farm where the effects of thorough ploughing and manuring are the

most strikingly seen in the increased product and profit for labour bestowed; though even our gardens are too often only the shadows of what they might be, and would be if cultivated properly. The farmer ploughs his garden deeper and finer than the rest of his premises, and manures it better, scarcely seeming to remember that field-crops require the same depth for the free expansion of their roots, and the same richness of soil to promote their rapid growth. Let a farmer examine the extent and depth to which the roots of corn in a loose and favourable soil will spread, and he will cease to wonder at the failure of a crop where the subsoil, at the depth of three or four inches, has never been stirred by the plough, and over the hardpan of which the tender fibres of the roots vainly wander in search of proper nutriment, and as fruitlessly strive to penetrate.

In loamy or sandy soils, the roots of trees have been found to penetrate to the depth of ten or twelve feet; and the roots of the Canada thistle have been traced six or seven feet below the surface. Wheat, if planted in a mellow, rich soil, will strike its roots three feet downward, and elongate much farther horizontally. The roots of oats have been discovered at the distance of eighteen inches from the stem; and the long, thread-like roots of grass extend still farther. The roots of the onion are so white that in a black mould they can be readily traced, and in a trenched or spaded soil they have been followed to the depth of two feet. The potato throws out roots to the extent of fifteen or twenty inches; and the tap-rooted plants, turnips, beets, carrots, &c., independent of the perpendicular root, spread their fibres to a distance which equals, if it does not exceed, that of the potato. It is perfectly absurd to expect to succeed with roots of this class, unless the ground is so mellow as to allow them to penetrate and grow freely; we have measured a carrot drawn in our garden, smooth and straight,

which exceeded twenty-six inches in length; yet the soil, when first applied to the purposes of a garden, was far from being deep or penetrable. Land cannot be considered in good tilth, unless by ploughing the earth it has been mixed with vegetable or animal matter to the depth of ten or twelve inches; and Judge Powell states, that by manuring and ploughing he has converted shallow, unproductive earth into rich, fertile soils, to the depth of at least fourteen inches.

There is a constant tendency in earths to consolidate (clayey or aluminous ones more than others), which manuring and ploughing will in a great measure prevent; and loosening the soil in all cases allows the roots to sink beyond the reach of droughts, permits them to range freely in search of proper nutriment, and in the same proportion increases the chance for a profitable crop.

The extreme difficulty of rendering tenacious and stiff clays, or what are termed hardpan-soils, fit for cultivation by any of the ordinary methods of ploughing and manuring; and the fact that covered draining in such soils will in most cases cost more than the actual value of the land (since the drains in soils of this class must be made deep and near together in order to be effectual), has induced practical farmers in England to endeavour to devise some way of overcoming the evil without the expense of covered draining. It is well known by those who cultivate stiff clay or hardpan soils, that such are the first to suffer from excessive moisture or excessive drought. Their compact nature retains on the surface all the rain that falls upon it until it runs off or is carried off by the slow process of evaporation: thus in wet seasons drowning the plants, while in dry ones, as the absorbing or conducting powers of such soils are always small, the surface-moisture being evaporated, the plants are deprived of their proper nutriment, and in many cases perish from the difficulty

the roots find in penetrating the earth to a depth sufficient to reach any moisture.

It is evident, then, that if, in such soils, the earth could be moved and broken up to the depth of eighteen inches or two feet, without having the unproductive earth brought to the surface, that an opportunity would be furnished for superfluous moisture to drain from the surface, and also for the roots to penetrate to a depth that would ensure their not perishing from drought. Manure or sandy marls, which, when spread on the surface of such soils, can only be productive of temporary benefit, would, where the hard substratum was broken up, penetrate deeper, their effects be longer felt, and, in fact, a new and fertile soil, suitable for the production of any plants, would be gradually formed.

Deep-ploughing or trench-ploughing was at first attempted to effect these desirable results. In this process one plough turned over the surface, the furrow-slice being of the depth of six or eight inches, and of the necessary width. Following immediately after, and in the same furrow, was another plough with a strong team, that broke up in the hard, compact ground another and still deeper furrow, throwing the earth upon the surface, and thus, in effect, reversing the soil to the depth of twelve or fourteen inches. This mode of ploughing was found to remedy, in a great measure, the evils of stagnant water on the surface, and the suffering from drought; but it produced another serious one, viz., that for a year or two, and until corrected by heavy manuring, the compact soil so turned up was steril and barren, hardly paying the expense of cropping. Unless, therefore, manure could be had in any assignable quantity, trench or such deep ploughing was found to be inexpedient in soils of this class.

It was at last conceived, that a plough which should loosen and pulverize the soil to the depth of eighteen or twenty inches, without bringing the *dead*

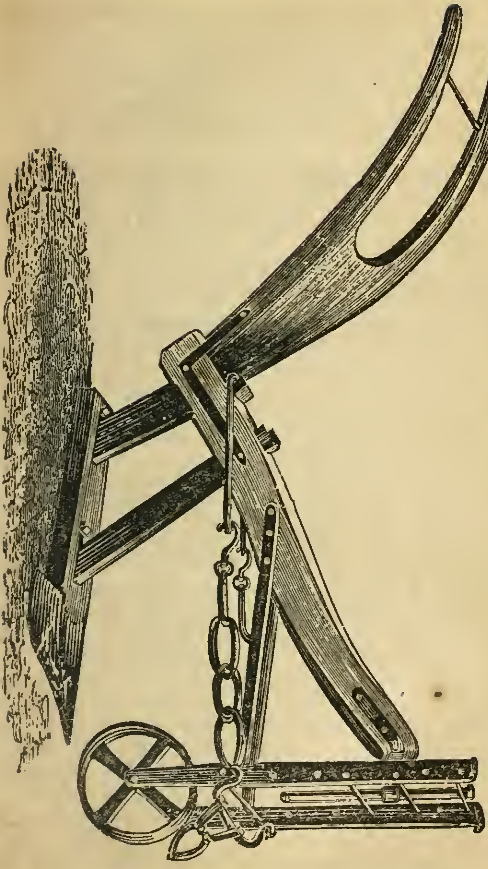
earth to the surface, would produce the desired effect, and obviate the evils of trench-ploughing. A plough for this purpose was invented in England some six or eight years since, which produced the desired effect on the soil, but which was so costly and clumsy a contrivance (being about fifteen feet in length, weighing not less than four hundred and fifty pounds, all iron, and requiring six or eight horses to work it in a compact soil), that it did not come into general use, though its benefits were incontrovertible. Since that period several have been announced, but no one of them seems to have met with general favour. About four years ago, the attention of Sir E. Stracey was directed to the subject, and a plough was contrived by him, which, with some improvements since added, seems to have left nothing to be desired, so far as the plough is concerned. This plough is thus described, in a letter from the inventor to the editor of the London Farmer's Magazine. "I beg to state, that four years since I invented a plough for breaking up the hardpan, as it is called, which lies a few inches from the surface of the greater part of our Norfolk lands, and which is apparently composed of gravel cemented by clay, and so hard as even to resist several blows of the pickaxe. I have improved much the construction of the plough from what it was at first. My plough now weighs only one hundred and fifty pounds, and the whole length, from the extreme end of the beam to the extreme end of the handles, is only seven feet: the head of the plough, including the share, is only twenty-four inches; and I can plough easily, with three horses, an acre and a quarter a day, to the depth of eighteen or twenty, or even twenty-four inches. The plough breaks the pan or soil without turning it up; and it is my intention to make use of it for planting trees, instead of trenching the ground for that purpose."

In the same Magazine for September last, there is

n engraving of the plough (see opposite), showing ts construction and mode of operation. That it will answer the end designed we cannot doubt; and we hope that some enterprising mechanic in this country will manufacture a similar one; or, judging from the usual results in such cases, an improved article, for the use of American farmers. We know there are large sections of our country where such an implement would be invaluable. We condense from the remarks accompanying the engraving the following account of the benefits ascertained to result from its use.

1st. That, by breaking up the soil to the depth of eighteen inches (if for the purpose of planting trees, twenty-four inches), the tender roots of plants are enabled to descend to a greater depth, and obtain their necessary food from those parts of the subsoil from which no nutriment was formerly derived; in addition to which, air and moisture having more easy access to the roots of the plants, farther nourishment is thereby afforded.

2d. The work done by the subsoil plough far exceeds trenching with the spade, as this plough only loosens and breaks the earth all around, without turning the bottom soil to the top, which in some, if not in most cases, would be injurious to vegetation. Plants in their infancy, like animals, require the best and most nutritious food; and when the delicate roots have acquired a sufficient degree of strength, they will be enabled, from looseness of the subsoil, freely to extend themselves in search of nutriment. In the mean time, the leaves are carrying on the elaboration of the juices and nutritive matters furnished by the roots. The distance that roots will penetrate under favourable circumstances is not generally understood. In Oxfordshire, the roots of some wheat sown in a filled-up gravel-pit were traced nine feet into the ground; and the Society of Arts in London have a stalk of wheat preserved in a glass case with roots six feet long.



3d. By this deep tillage the rains will sink into the ground, and afford moisture to the deep roots of plants during the heats of summer; the fields, as experience has shown, may be laid down with furrows, except, perhaps, in very strong lands, and stagnant surface-water will in most cases be prevented.

4th. The deep tilling will enable farmers to raise, as in a garden, carrots, beets, and other tap-rooted plants, for which stiff soils without such ploughing are altogether unsuitable. The carrot and the parsnip, in some cases, are to be preferred to turnips, as affording sweeter and more nutritious food for milch cows.

5th. This ploughing is far preferable to trenching, or spading, or any other mode of moving the subsoil yet devised, as it is equally effectual, and may be done at one fourth the expense. Four horses will probably be required for the deep plough the first time of ploughing, and three afterward, without the assistance of the first plough, which, if the soil is very compact, or a gravelly hardpan, will be necessary to turn off the upper stratum of soil, as before mentioned. This plough is made of wrought iron, and well braced, as the pressure on the centre of the beam is very great.

There is another reason, we think, why subsoil ploughing would be advantageous on the hardpan soils of this country, intended for wheat, which is not noticed above, and which, indeed, would be inapplicable to a large part of England. In that country, with the exception of some parts of Scotland the temperature rarely descends so low as to endanger the freezing out of wheat in any soil; while in this country the evil of freezing out is the most formidable one which the cultivator of clay soils has to encounter; and this evil is constantly increasing on lands of which clay forms the principal ingredient, unless some method of counteracting it can be

devised. For the reasons before given, we think that subsoil ploughing will do this more effectually than any other method. By allowing the surface-water to settle, the clayey part will not become so saturated, and, of course, frosts will have less effect than where the upper soil is nothing but paste. The roots of autumn-sown wheat will penetrate also deeper into the earth, and thus be better prepared to resist the lifting process of the spring frosts. And though soils so ploughed will, in the course of a few years, be again closely settled together, yet each successive breaking of the soil, by admitting the introduction of the roots of plants, and the natural sinking of manures applied to the surface, will eventually convert the whole soil so stirred into good arable land, and give a depth sufficient for any of the ordinary purposes of agriculture. For ourselves, we think the subsoil plough promises greater advantages to the occupants of hardpan or tenacious clay soils than any system of culture yet devised for them ; and we shall be pleased to hear that our farmers, where such a plough is needed, have made a trial of its virtues.

The question is sometimes asked, whether it is best to plough land in the fall ; and, if answered in the affirmative, the reasons for such a procedure are demanded. We think that fall ploughing is desirable in most cases and on most soils, for the following, among other reasons that might be given.

1st. It is one of the established principles of philosophical agriculture, that the soil derives much of its productive power from the air ; and that chymical changes and combinations are constantly going on, by which fertility is greatly increased. These alterative effects of the atmosphere and these changes of the qualities of the soil are the more active and efficient as new surfaces are exposed to its action. For instance, much greater quantities of carbonic gas will be absorbed by a given surface

of earth, if that earth is frequently stirred, than if it were allowed to remain undisturbed. Ploughing, by exposing new surfaces to the action of the atmosphere, must be productive of essential benefit; and as fall ploughing generally takes place after crops which have partially exhausted the surface of some of its nutritive and absorbent qualities, its service in aid of spring crops must be very important.

2d. There are always on land more or less grass, weeds, stubble, or other vegetable matters convertible into mould by fermentation and decomposition: a process which is greatly aided by their being turned under the surface of the earth. Fall ploughing renders such substances much sooner available in advancing the growth of crops than they would be if left uncovered during the winter, independent of the great loss necessarily sustained by the washing away of the lighter portions, and their dispersion by the winds.

3d. Nothing acts more efficiently on moist soils in promoting vegetation than minute pulverization; and fall ploughing contributes to this most essentially. Lands that, if ploughed only in the spring, will remain in large cakes or lumps. defying the efforts of the farmer to reduce them suitably, will, if ploughed in the fall, be found loosened in texture and fitted for early operations. Frost is the most efficient disintegrator of the soil with which the agriculturist is acquainted, and he should avail himself of its valuable labours in all practicable cases.

4th. The earlier the ground can be prepared for the suitable reception of spring crops, such as corn, spring wheat, and barley, the better it will be found for the cultivator; and, in nine cases out of ten, early-sown crops are the heaviest and most productive.

5th. Ploughing land acts more effectually in destroying insects than any other mode of treatment, and fall ploughing for this purpose is preferable to

any other. Those insects which produce the most mischief to the farmer, such as the fly, cut-worm, grub, &c., cannot resist the frost of our winters, if prematurely exposed to its action by a fall ploughing. The cut-worm, which accumulates in such numbers in old meadows and pastures, is thus destroyed, and crops planted on them saved.

Fall ploughing has another advantage, in placing the work to be done at a season of the year when the farmer is less driven by his business than at any other time. In the spring, a vast amount of labour is required to be done in a short time, especially on those farms where spring is substituted for winter wheat; and every acre ploughed in the fall may be considered as forwarding the spring work one day at least. Besides, as most farmers manage their stock, their teams are much more capable of work in the fall than spring; the work is done when their horses and oxen are in good heart, and not during the faintness that accompanies the approach of warm weather. It is true, such a condition of working cattle or horses should not exist; their keeping should be a safeguard against falling away in the winter or weakness in the spring; but we are too often content to put up with things as they are, rather than make efforts to have them as they should be.

On soils very porous (those composed of gravel and sand), in which, for the want of a retentive substratum, manures are apt to sink and their good effects to be lost; or on lands liable to be washed, as side hills, where the finer particles of the soil are in danger of being carried off by every rain or the melting of the snow, fall ploughing may not be advisable; but on most others we are confident that its adoption will be attended with beneficial effects.

Lastly. Our summers are so limited in duration, that, unless the time allotted to vegetation is fully occupied by the growth and ripening of plants, the

certain failures of crops may be anticipated. Hence the farmer is usually more hurried by his work in the spring than he ought to be, in order to avoid having his crops caught by the early frost. It should be the object of the farmer to have his necessary labour as nearly equalized through the season as possible, and thus avoid all pressures at inconvenient times of the year. Experience shows that the farmer, in most cases, has more leisure hours in the fall of the year than at any other time; and he who would work it right should employ this time in advancing his next spring's work (for such fall ploughing emphatically is), and thus preventing the pressure of business then usually felt.

Much having been said of late in relation to deep ploughing, it may not be amiss here to discuss that question. We believe that the nature of the soil and subsoil should determine the depth. A shoal soil. with a clay subsoil, will not admit of being plougned deep; but any soil composed of loam or sand may, and probably ought to be ploughed much deeper than has been the practice of our farmers. For such sward land seven or eight inches are not too deep. The advantages are numerous. It will afford a better opportunity to cover long and unrotted manures, the fermentation of which beneath the sward must be of lasting benefit to the soil. It gives an opportunity to work above the sward with the smaller plough, harrow, and hoe; is a greater saving of the manure of the sward, which has been estimated at twelve tons to the acre; and, if the lana is to be stocked down immediately to grass without hoeing, it can be done much sooner, with the same degree of smoothness, by means of the harrow and roller: a deeper and looser soil is also created, much to the advantage of succeeding crops, inasmuch as the tendency of the manures ploughed in is to rise and pass off by evaporation, and not, as has been supposed, to soak downward. There are some

disadvantages in ploughing deep. More manure is required for a single crop. The crops will be later in arriving at maturity, which is a serious injury in some instances, to Indian corn particularly, though it is an advantage to many other crops, and especially to wheat, as it will be longer in growing, and, of course, less likely to blast, while it affords a better opportunity for harvesting, in connexion with the farmers' other crops. In deep ploughing, greater strength of team is required to plough the same land. We are, on the whole, decidedly of the opinion that good policy requires us to plough deeper than has been the general custom of our farmers.

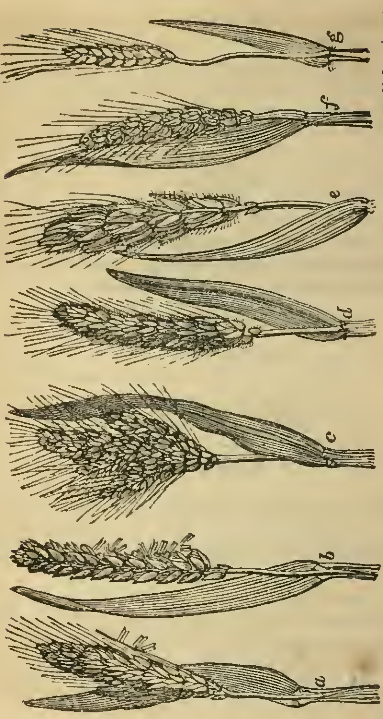
CHAPTER VI.

WHEAT.

Natural History of *the* Plant.—Varieties.—Best Soil for Wheat.—Manures.—Cultivation.—Harvesting.—Diseases.—Prevention of Smut.—Insect Enemies.—Conversion of Winter into Spring Wheat.—Italian Wheat.

Writers on the natural history of plants have enumerated seven species of this most important of the cereal gramina; and we present the figures representing the dfferent kinds, as copied from Loudon's Encyclopedia. They are as follows: (see next page.)

Loudon remarks, "that the first, second, fourth, and fifth sorts are by many botanists considered as only varieties, and it is doubtful whether the third and sixth may not be the same; the seventh has all the marks of a distinct species, but it is very questionable whether, if much cultivated, it would always continue to produce one row of grains."



1. *a*, *Triticum sativum*, spring wheat.
2. *b*, " *hybernum*, winter wheat.
3. *c*, " *compositum*, Egyptian wheat.
4. *d*, " *turgidon*, turgid wheat.
5. *e*, *Triticum Polonicum*, Polish wheat.
6. *f*, " *speltæ*, spelt wheat.
7. *g*, " *monococcum*, one-grained wheat.

We are inclined to consider the spring, winter, Egyptian, turgid, and Polish wheat as but varieties of one species; and that the spelt and one-grained wheat are to be considered as separate species. This opinion is rendered more probable from the recently discovered fact, " that the white, red, awned

or bearded, and the beardless wheats, change and run into each other in different soils and climates; and even the Egyptian is known to change to the single-spiked common plant."—(*Encyc. Amer.*) On the contrary, the spelt and one grained have never been known to change their peculiar characters; and the spelt in particular, by the nature of its adhering husk, appears as distinctly marked as rice or barley.

Adapted to all the temperate countries and all the elevated regions of the torrid parts of the globe—possessing the greatest quantity of nutritive matter to be found in any vegetable or animal substance—affording a substance by nature superior to anything else for the composition of bread—if these qualities can entitle any single plant to the preference and cultivation of man, that preference must belong to wheat. Through the whole of Europe, except the extreme north, in China, Asia Minor, Syria, Persia, the north and south of Africa, and almost the whole of North and South America, wheat is grown to a greater or less extent, nothing but extreme heat or extreme cold opposing effectual barriers to its cultivation.

The most permanent varieties of cultivated wheat are the red and white berried, and the spring wheat, the berry of which is usually red. "Winter wheat sown in the spring will ripen in the following summer, though the produce of succeeding generations of spring-sown wheat is found to ripen better."—(*Encyc. Amer.*) We have doubts, however, as to the entire correctness of this statement; as in several experiments which have fallen under our knowledge, winter wheat sown in the spring did not come to maturity. To ensure its ripening the first season, it appears necessary that germination should be commenced previous to sowing, as the period, if sown as spring wheat usually is, does not seem long enough for winter wheat to perfect the process of

growth and maturing. The remark that succeeding generations of spring-sown wheat ripen better, is important, and should be kept in mind by all who have attempted the growth of winter wheat as spring wheat. Loudon says, "In the cultivation of spring-sown winter wheat, it is of importance to use the products of spring-sown grain as seed, as the crop of such grain ripens about a fortnight earlier than when the produce of the same wheat, winter-sown, is employed as spring seed." By thus shortening the period required for its growth, in the course of a few generations spring wheat is produced; and when the original winter wheat is of a good variety, the spring wheat will possess the same qualities. If, as we are confident might be done, the white flint could be converted into a spring wheat, retaining its present flouring qualities, an incalculable benefit would result to the country.

The different varieties of wheat have a constant tendency to change or deteriorate, owing to bad seed, improper soils, and crosses with other and, perhaps, inferior varieties. But this tendency can be counteracted by choosing the best wheat, and that grown on soils the most congenial to the plant, for seed; and in this way any desirable variety may be kept good for any length of time. Within a few years, several new varieties (the result of careful cultivation), possessing superior qualities, have been introduced into England and this country. Varieties may be increased to any extent in the following manner: Select from a field of wheat a root or a simple spike that possesses the qualities of straw, berry, colour, weight, time of ripening, &c., desired. From the ear or ears thus selected, choose the best sized and proportioned kernels, and sow them in a soil suitable for wheat, and where the plants will be secure. When the produce of these is ripe, select the best ears and best grains, and continue sowing until a bushel or two of the desired quality is ob-

tained, which will be the second or third year. Sometimes excellent varieties are discovered accidentally, as the celebrated hedge-wheat of England, the first ear of which was found growing in a hedge in Sussex; and the swamp or flint wheat of this country, which originated from a few ears found in a swamp near Rome in this state.

In few things are the chymist in his analysis of soils, and the farmer in the actual tilling the earth, better agreed than in the kinds of soil best adapted to produce wheat. Rich clays, or those in which sand and lime are so blended as to resemble in their constituents marl, when properly combined with vegetable or animal matter, are found to be the best soils for wheat. Next to these, heavy loams, or those in which silicious matter preponderates, but which contain sufficient clay to make them retentive, when united with the proper proportions of nutritive vegetable or animal matter, are the most productive. One of the best soils for wheat in England, analyzed by Davy, gave of carbonate of lime 28 parts; silica, 32 parts; clay or alumina, 29 parts; and animal or vegetable matter, 11 parts. Perhaps one of the surest tests in determining the qualities of a soil for wheat, or its fertility generally, is to ascertain its power of absorbing moisture. This may be known by drying finely-pulverized earth to a temperature of 212°, and then exposing it to air saturated with moisture; and that which under the same circumstances acquires the most weight in a given time, by the absorption of water from the atmosphere, will be found the most fertile soil. Some soils treated in this way will in an hour gain 18 or 20 parts in a thousand; while others (and these are always barren, or nearly so) will gain in the same time only from two to five parts. Perhaps the most fertile soils in the United States are those based on limestone strata, as the principal part of central Kentucky, and the limestone zone of Western New-

York; and these soils are noted for their powers of absorption. Though the soil covering the rocks may be but a few inches in depth, owing to this quality it rarely fails of proving fertile, and excellent for wheat. Experience, however, shows that wheat may be made to grow on most lands, unless the lightest and poorest sands be made an exception; but on soils not naturally favourable, they must be made fit by preparation and manures. Where soils are too heavy or contain too much clay, calcareous sand or gravel is one of the most efficient alteratives; and where it is too light and silicious, the combination of marl is equally effectual.

In determining the best manure for wheat lands and the manner of its application, agricultural chymistry has done much for the farmer. In determining the food of plants, it was necessary to discover their constituents; what they obtained from the air, and what from the earth; what their peculiar qualities were, and how their wants could be best supplied. In analyzing wheat, it was found to contain, in greater quantities than any other plant used for food, the peculiar principle of gluten, a substance nearly resembling some kinds of animal matter; and, as this was an essential part of all good wheat, it became desirable to ascertain how this food for the wheat-plant could be obtained. It was found by experiment, and from the nature of the chymical combinations, that gluten was the result of the action of lime on animal matters; and the natural inference was, that lime and animal manures would be the best for the cultivatian of wheat, and the experience of farmers in this case is supported by the united testimony of Chaptal, Thaer, Davy, and Grisenwaithe. Lime, by common consent, is considered essential to the production of good wheat. Heavy straw may be grown without it by the aid of other manures; but the berry will be defective, and the flour,

owing to the absence of gluten, cannot be made into good bread: it will be heavy and unwholesome. In soils, then, that are by nature destitute of this ingredient, it must be supplied; and the quantity will vary according to the qualities of the lime, and the soil to which it is applied. An essential benefit will be derived from the small quantity that can be distributed by rolling seed-wheat in lime; and no danger need be apprehended if the quantity even reaches 50 or 100 bushels per acre. Lime in the soil is one of the most permanent manures, being inactive, except in its mechanical effect, unless brought in contact with animal or vegetable substances, in a state suited to chymical action and combination. Gypsum, or the union of lime with sulphuric acid, is considered by some a valuable manure or top-dressing for wheat; but we think, in most cases, the greatest benefit is derived from this substance by its action on clover sown with wheat; and this application and union of crops is found to be one of the surest methods of renovating or perpetuating the fertility of a soil.

In sowing wheat, few or no cases exist in which the seed should not be prepared, and in which there will not be a decided benefit from pickling. Pickling operates favourably in two ways; it assists the germination, and it prevents smut. All men acquainted with wheat, or who are dealers in the article, will admit the necessity of guarding against smut, as there are comparatively few fields in which it is not to be found more or less; and, in the least quantity, its pernicious effects are discovered in discolouring the grain, and injuring it for flour or seed. Stale urine, from its containing considerable quantities of ammonia, may be considered the best article for pickling wheat; but, where this cannot be had, a strong brine of common salt may be used. The more effectually this brining or pickling is performed, the better it will be for wheat; and if the process is completed, as it invariably should be, by rolling

the seed when wet in fresh-slaked lime, little danger is to be apprehended either of smut or of the eggs of insects on the berry. In a late number of the British Farmer's Magazine, a preparation of *arsenic and potash* is highly recommended as a pickle for wheat. It may, and undoubtedly would be efficacious in the prevention of smut, as the smallness of the seeds of this fungus render them peculiarly liable to be acted upon by mineral poisons; but the dangerous nature of the substance, and the fact that a harmless substitute is found in lime, will, we think, prevent its general adoption.

The quantity of wheat that should be sown on an acre, and the best method of sowing it, are points by no means settled among farmers. As to the first, no definite quantity, we think, can be fixed upon, as this will depend on the quality of the soil, the kind of wheat used, and the mode of sowing. Some wheat tillers or shoots more stems from a root than others; and a new variety has been advertised in England, so remarkable for this quality that half a bushel is said to be sufficient for an acre of land. This might do if the seeds were placed at proper distances, and all germinated, two conditions rarely or never found united. In England the quantity varies from two and a half to four bushels per acre. In this country, from one bushel to two bushels are used. We have known an instance the present season, in which 38 bushels were raised from one bushel sown on one acre. In Europe, and particularly in Britain, drill-sowing was a few years since extensively practised, and still is by many of the best farmers, such as Mr. Coke of Holkham, now Earl Leicester. But the practice is declining in districts where it was once generally followed, and the broadcast system, as used in this country, is taking its place. In a favourable day, an experienced man will sow the seed with sufficient regularity in this way; and it is the general opinion, sanctioned, it would

seem, by experience, that on soils where wheat is liable to be thrown out by freezing, ploughing in the seed with a slight furrow is preferable to harrowing. The practice called *ribbing* is recommended in the Encyclopædia Britannica, and we have heard some farmers in this country speak of the plan with approbation. The land, after being properly prepared, is thrown into ridges and furrows with the plough, to the depth and at the distances desired; the wheat is then sown broadcast in the usual manner, and the greater part will, of course, roll into the furrows; the process is then finished by a light harrowing across the furrows, and the grain will come up in rows with much regularity. This method allows the sun to reach the ground more effectually than in the usual way; but the comparative advantages of the two modes can only be determined by farther experiment.

In this country, when the farmer has committed his seed-wheat to the earth, he usually acts as though he had done *his* part, and trusts to Providence for the rest. Trusting in Providence is very well; but what is called so is, nine times out of ten, so far as farming is concerned, trusting to chance for a crop; and we cannot help thinking, that if, in addition to this trust, a little attention was paid to freeing the wheat-crop while growing from the weeds that so numerously infest most of our farms, sensible benefits would result. That hand-weeding the wheat should be carried in this country to the extent that it is in Britain or Holland, cannot be expected—certainly not in the Northern States: the prices of labour and the habits of our citizens render it impossible. In foreign countries, the greater part of all such light field-labour is performed by women; and a late visiter to Holkham mentions having seen from fifty to one hundred females employed at the same time on the crops. Such an occupation for American females is not de-

sirable; their sphere of usefulness is elsewhere; and we trust the time is distant when such things will be tolerated or become necessary here. But we are of the opinion that the time of men and boys could for a few days be well employed in ridding the fields of stein-krout, and other villanous weeds that so frequently overtop the wheat-plants, and exhaust the soil of the nutriment intended for them. That on many farms the crops are lessened from a fourth to a fifth, in consequence of imperfect tillage and foulness of the land cropped, does not admit of a doubt; and if additional labour is necessary to remedy this great evil, let it be employed, or no more land put under the plough than can be properly tilled and cleaned.

HARVESTING.

Wheat, if harvested too early, will lose in weight very considerably, though the flour produced from it will be of a superior quality. If allowed to stand too long, there is danger of loss from its shelling freely in cutting and carting; and, though more flour is made, it has not the pure whiteness of that of earlier cut grain. In order to avoid the loss by shrinkage on the one hand and shelling on the other, it becomes of considerable consequence to determine the most advantageous period of cutting wheat. That wheat should be allowed to stand until the berry will be mature, there can be no doubt. After this time, all is unnecessary exposure to danger. The wheat flint is a wheat which, in the field, resists two causes of danger and loss better than any variety with which we are acquainted; it rarely germinates on the stalk while standing, as some other kinds will, in unfavourable weather; and, owing to the firmness with which the kernel is embraced by the chaff, the loss by premature shelling is inconsiderable.

Brown, in his treatise on Rural Economy, an ex-

cellent English publication, says, "It is necessary to discriminate between the ripeness of the straw and the ripeness of the grain; for in some seasons the straw dries upward; under which circumstances, a field to the eye may appear completely fit for the sickle, when, in reality, the grain is imperfectly consolidated, and, in fact, not much removed from a milky state." We have seen wheat cut in this state, and when put immediately in a mow or stacked, it can hardly fail of receiving injury. Such grain, though it can receive no benefit from the root by standing, is materially aided in ripening by the action of the air and the sun. Mr. Shirreff, in the Quarterly Journal of August, gives as reasons for cutting wheat before it is dead ripe, that is, when the straw begins to turn, or becomes yellow immediately below the ear; first, an increased quantity of grain, greater security from the weather, an improved quality of straw, and an extension of the harvest season. Secondly, greater security against the effects of wind or rain, either as it effects the shelling, discoloration, or germination of the grain. The colour of wheat which has not been cut till it became dead ripe is generally of an opaque, whitish hue; while that cut before it was dead ripe is transparent and tinged with brown. The latter description of wheat bears the highest price in all markets. Where, however, wheat is smutty, it should be allowed to stand as long as it can be left with safety, as much of that fungus will be lost in the field, and the remainder will be most easily broken to pieces and blown away in the process of threshing and cleaning. But it may be considered as a general rule, and one which is sanctioned by the practice of the most skilful farmers in this country and abroad, that it is better to cut wheat early than late, and that there is less danger of loss by shrinking than shelling.

The time necessary for wheat to remain in the

field after it is cut, before it is put in the barn or stacked, must in a great measure depend on two circumstances: the ripeness of the grain when cut, and its freedom from everything green when bound into sheaves. If the grain is perfectly ripe, and the straw thoroughly dried, and the sheaves free from grass or weeds, wheat may be cut, and stacked or housed the same day; but as these conditions are rarely found united, and nothing is more fatal to the quality of wheat than heating and moulding in the mow or stack, it is usually better to let it be effectually cured in the field than to run any risk from premature housing. The best method of securing it from sudden showers or unfavourable weather while in the field, is a question of interest to the farmer. He well knows that if a sheaf of wheat or other grain is once thoroughly soaked, it takes a long while to dry; and though a slight wetting of the heads or butts of a sheaf will soon pass away by evaporation and exposure to the air, yet wheat in the centre of the sheaf, where the straw is compressed by the bands, requires many days of fair weather for its dissipation. Various methods are adopted by farmers to save their grain from wetting. Some lay it in the form of a cross, the heads in the centre, and the whole surmounted with a sheaf so disposed as to throw off any slight showers that may fall. Others place their wheat in shocks, the sheaves two and two standing on their butts, the heads of the sheaves inclined to each other, and the tops covered by two sheaves laid their butts to each other, and the tops spread out so as to shield the standing sheaves as much as possible. Others place their wheat in the same position as the last, with the exception that all of the shock is left standing, and no sheaves are placed over the heads. In fine weather this method is preferable to any other, as the wheat is more exposed to the influence of the air and sun, and is, consequently, sooner fit for the

barn. It will even stand through a shower not very severe, in this way, with little injury, if followed by sun and clear air; but it is evident that heavy or long-continued rain, by the thorough soaking the sheaves must receive, can scarcely be otherwise than prejudicial to the quality of the wheat; and it is by getting in wheat before the centre of the sheaf is dry after wetting, that more of it is injured in this country than in any other way. Another, and, perhaps, all things considered, the safest way, is to put up the wheat the day it is cut; and, if rain is apprehended, as fast as it is cut and collected, to place it in stacks containing from eight to ten shocks each, the sheaves built in compactly with their heads to the middle, the butts declining outward, and the stack topped with a sheaf so arranged as to cover the cone of heads, and throw off the rain in every direction. Wheat so put up, and well managed, may stand for weeks without injury, and wait the pleasure of the owner for gathering into the barn; and the green stuff with which the butts may be filled will be effectually dried, and thus prevented from injuring the wheat, as it would have done had it been housed before curing. Experience here, however, is the surest guide, as the seasons differ in different places; and what might be followed in one place with safety, would be ruinous in another. Thus, in northern latitudes, far more care is required than in southern ones; and while the grain of the north of Europe can with difficulty be saved at all, nothing is more secure from injury by the weather than the harvests of Spain and Italy; and the same remarks are true, though to a less extent, on this Continent. It should, however, be remembered, that experience, both here and abroad, shows that, while other methods of securing *may* be safe, stacking in the field, when the stacks are properly put up, is certainly so, and should generally be followed for that reason.

DISEASES OF WHEAT.

The most common diseases of wheat are smut and blight. The first is of two kinds; in one of which the farina of the berry or grain is converted into a black powder, and the husk is more or less covered with the same. This kind of smut is oftener found on oats and barley than wheat, though the latter is not exempt. In the other kind of smut the kernel alone is affected; the envelope rarely breaks until passed through the machine in threshing, and even then frequently does not injure the quality of the wheat, or seriously affect the price. As mentioned before, brine and quicklime are antidotes to smut in any form; and a preparation of arsenic and potash has also been lately recommended for the same purpose.*

* [Various experiments, or series of them, have been made to test the efficiency of the several preparations for seed-wheat, one of the fullest of which we copy from the Quarterly Journal of Agriculture, to which they were communicated by Mr. Donaldson, of Leicestershire.

Experiment No. 1.—Pure wheat sown without any preparation produced 866 sound ears and 2 smutted; in the proportion of 433 sound ears to one of smut.

Ex. No. 2.—400 grains of wheat impregnated with smut-powder, and sown without any preparation, produced 210 sound ears and 463 smutted; proportion, one sound ear to two smutted.

Ex. No. 3.—400 grains impregnated with smut, and washed in chamber-ley and limed, produced 700 sound ears and 60 smutted; proportion, 11½ sound to one smut.

Ex. No 4.—400 grains impregnated with smut, and washed with chamber-ley, produced 560 sound ears and 106 smutted; proportion, five sound to one smutted.

Ex. No 5.—400 grains impregnated with smut, steeped in arsenic and water and limed, produced 600 sound ears and 41 smutted; proportion, 14 sound to one smutted.

Ex. No. 6—400 grains impregnated with smut, and rubbed with dry arsenic, produced 538 sound ears and 146 smutted; proportion, four sound to one smutted.

Ex. No. 7.—400 grains impregnated with smut, and steeped

The latest writers on blight, such as Davy, Banks, Loudon, and Grisenthwaite, divide this disease into four varieties: blight from cold and frosty winds; blight from a sultry and noxious vapour; blight from a want of nourishment; and blight from the extensive propagation of a minute fungus.

Blight from cold winds is usually confined to those from the east and northeast, and is felt chiefly in the

in vitriol and water and limed, produced 635 sound ears and 40 smutted; proportion, 16 sound to one smutted.

Ex. No. 8.—400 grains impregnated with smut, and steeped in copperas and water and limed, gave 205 sound ears and 445 smutted; proportion, one sound to two smutted.

Ex. No. 9.—600 sound grains from a badly-smutted crop, pickled and sown without any preparation, produced 612 sound ears and 53 smut ones; proportion, 11½ sound to one smut.

Ex. No. 10.—600 sound grains impregnated with chamber-ley and limed, produced 757 sound ears and 16 smutted; proportion, 47 sound to one smutted.

Ex No 11.—200 grains impregnated with smut, and sown without any preparation, produced 67 sound ears and 375 smutted; proportion, one sound to five smutted.

Ex. No. 12.—200 grains impregnated with smut, and prepared with chamber-ley and limed, produced 374 sound ears and 43 smutted; proportion, nine sound to one smutted

Ex. No 13.—200 grains impregnated with smut, and steeped in arsenic and water and limed, produced 443 sound ears and 44 smutted; proportion, 11 sound to one smutted.

Ex. No. 14—200 grains impregnated with smut, and rubbed with dry arsenic, produced 317 sound ears and 43 smutted; proportion, eight sound to one smutted.

Ex. No. 15.—200 grains impregnated with smut, and steeped in vitriol and water and limed, produced 430 sound ears and 40 smutted; proportion, 11 sound to one smutted.

Ex. No. 16.—200 grains impregnated with smut, and steeped in copperas and water and limed, produced 260 sound ears and 190 smutted; in the proportion of 1⅓ sound ears to one smutted.

These experiments, and they were made by Mr. Donaldson with great care, agree in the main with those instituted by Sinclair and Marshall, and those made by Arthur Young. The very great difference in sowing grain pure and free from the contagion of smut, and that infected, both without preparation, as shown in the first two experiments, is decisive on the point of infection, and should induce every farmer to use his utmost endeavours to sow none but pure seed.—*Eds.*]

spring by its effects on fruit. Blight originating in heat and vapour generally occurs in the summer, when plants have attained their full growth, and when there is no cold weather or wind to produce it. Blight from want of nourishment is found in grain on thin, poor soils, where the plants have been prematurely forced into blossom, and the ear ripens or dries before it is filled. Blight from fungus propagations is the most common and the most injurious to grain. It generally assumes the appearance of a rusty-looking powder, soiling the fingers or clothes when touched; and when in sufficient quantity seriously to injure the crop of grain, it gradually passes into dark patches or lines on the stalk or leaves, effectually preventing any farther ripening of the straw or grain until dried by cutting and curing. Fields of wheat are injured by rust or blight in the most irregular and capricious manner; and there is reason to suppose that the cause or causes are not yet perfectly understood. One of the most plausible conjectures, perhaps, is that of Grisenthwaite in his New Theory of Agriculture, viz., that in many cases in which blight attacks grain, it may be for want of the peculiar food requisite for perfecting the grain—it being known that the seeds of plants contain primitive principles not found in the rest of the plant. Thus the grain of wheat contains gluten and phosphate of lime; and, where these are wanting in the soil (that is, in the manured earth in which the plant grows), it will be unable to perfect its fruit, which, of course, becomes more liable to disease. The fungus or rust of wheat is called the *Uredo linearis;* and as a fungus something similar in appearance is found on the common barberry bush, *Berberis vulgaris*, it is a general opinion among farmers that this bush is the cause of blight in the grain-fields of this vicinity.* This would seem to be entirely an error, as micro-

* Albany.

scopical observation shows the fungus to be totally different in its form and growth from the grain fungus, and, therefore, that the one species cannot proceed from the other. Some have supposed that, instead of being a fungus, the rust of wheat is merely an exudation of its juices through the ruptured vessels of the plant, and that this loss of sap occasions the shrinking of the grain.

Considerable observation of the state of grain previously to, and during the appearance of blight, and the microscopical growth and spread of the rust or fungus, have induced us to suppose that in most cases the operation of both these causes, viz., the bursting of the vessels and the spread of the fungus, are present in blight. The rust usually appears first in patches on the leaves; and it spreads to the stalks of the wheat only when the state of the weather and of the plants is such as to justify the supposition of the exudation of sap. If the stem is partially dried or ripened, the sporules or seed of the fungus seem spread over its surface in the exuded but dried sap, like a reddish or yellow varnish. If the stem is green (as in the case of late-grown or winter-killed grain) at the time of attack, the flow of sap continues through the ruptured vessels, and the sporules, finding in this moisture a convenient nidus or place of growth, penetrate the openings with their roots, and assume the linear appearance so characteristic of this disease. The rapid propagation of this fungus will not be matter of wonder when it is remembered that it passes through its stage of growth and ripening its seeds in little more than twenty-four hours; and that, according to Ehrenburg, some species of fungi contain 250,000,000 of seeds. The minute particles that make the smoke of the common puff-ball are the ripened seeds of that fungus; and those of the *Uredo* are so small as to be undistinguishable, except in masses, without the aid of the microscope. If the rupture of the vessels

of the plant is, as we suppose, owing to excessive heat and moisture, by which they are overcharged while the cuticle or skin of the plant is weakened and softened, it does not appear that much can be done by the efforts of man to prevent the disease. Grain grown on favourable soils properly prepared, and that comes to maturity early, is more likely to escape blight than that grown on unfavourable soils, or than that which, owing to any cause, is late in coming to maturity, since the hot, wet weather of July is likely to find such late wheat in a proper state for the development of the disease. The most probable means of prevention would appear to be, to free the grain from the superabundant moisture that softens the stem at times when the state of the atmosphere would seem to be favourable to the bursting of the vessels by increased circulation, and this may be done by sweeping the fields with a rope drawn by two men over the heads of the grain, the men walking in what are called the clearing up furrows to prevent trampling it down.

The roots of the wheat-plant are liable to be attacked by grubs and worms, the larvæ of various beetles: among which, the most destructive are those known to us as the wire-worm, the larvæ of the *Elater segetis*, and the red-headed large white grub, the larvæ of the May-bug, cockchaffer, or black bug of summer evenings, *Melolontha vulgaris*. These sometimes commit serious ravages on the roots of grass, corn, and wheat; but usually, where found at all, their number is so limited as not to prove very injurious to the crops. Both of these grubs or worms live some years in the larvæ state, in which they are most destructive; and where the ground will admit of very late ploughing, it will probably prove the most certain method of destroying them, to expose them in this way to the severe frosts of winter. The perfect insect of most varieties of night-flying beetles, the May beetle particularly, is

very easily attracted by light, and this propensity has been taken advantage of for their destruction in great numbers. When they appear in the summer, it is most commonly but for a few days, on the evening of which, by kindling large fires of brush, shavings, &c., all the bugs of the vicinity will be attracted by the light, and perish in the flames. Thousands may be destroyed in this way, and thus new deposites of eggs in the soil be prevented.

But the insects that attack the wheat while growing and in the ear, are by far the most formidable enemies of that grain which the farmer is compelled to encounter; and of these, two are the most conspicuous, and have made themselves known and dreaded wherever they have appeared by their frightful ravages, viz., the Hessian-fly, the *Tipula tritici* of Linn. and Mitchell; the *Cecidomia* or *Cecidomyia destructor* of Kirby and Swainson; and the wheat-fly, the *Cecidomia tritici* of the later writers. The Hessian-fly has been known in this country for more than half a century, and has at times destroyed entirely, in many places, the wheat-crop, so as to leave nothing for harvesting. This fly deposites its eggs in the young grain, both in the fall and spring, near the joints of the root, within the leaf. Here the worm is hatched, and preys on the juices of the tender stalk; and, when they are numerous, the plants turn yellow and die from this abstraction of sap. The larvæ remain in the ground over the winter, and assume the form of the perfect or winged insect in May, or in season to deposite their eggs in spring grain. As they undergo two transformations within the year, no effectual method of destroying them has yet been discovered; though it has lately been said that feeding the plants as close as possible to the ground, if the insect is discovered in the fall, will save the field from their ravages. Sheep are the best for this purpose, as they gnaw the plants close, and their feet injure the roots less than other

animals. A late Pennsylvania journal has asserted that the Hessian-fly deprives itself of its wings previous to depositing its eggs within the leaf plant. We have observed the habits of this insect with some care, but have never noticed such a shedding of the wings. We do not deem it incredible, however, as an instance perfectly analogous occurs in the case of the female of the common grasshopper, *Gryllus tettigonia*, which, as every one may have noticed, deprives herself, or is deprived of her wings in such a manner that the mere stumps of them are left, which form no hinderance to the body in penetrating the ground and depositing the eggs. Notwithstanding the supposed origin of the Hessian-fly, it remains uncertain whether the insect was known in Europe at that time, though it has since become generally known.

The wheat-fly, that produces the worm in the ear, and which promises to become the great enemy of the wheat grower, since, as far as it has spread, it rarely fails of proving fatal to the crop, has but lately appeared among us; and its habits do not appear to be well understood, even in those sections where it first attracted notice, which was in the vicinity of the North River. This fly has been described by different observers as red, green, orange-coloured, yellowish-red, and dark coloured; and the probability is, that more than one variety of the same species act as depredators. We have observed them carefully while in the act of depositing their eggs on spring wheat; and we have detected a similar worm, the product of a similar fly, in ripe berries of the raspberry and blackberry kinds. The fly is in general orange-coloured, with a greenish tinge, which in certain lights gives a rather changeable appearance, and is provided with a retractile ovipositor, which, when not in use, is partially folded under its belly, very much in the manner of that of the common bot-fly of horses. This instrument is used

for placing the egg in immediate contact with the berry while in its softest state; and sometimes the glass will detect three or four of these little worms playing on a single kernel. Most generally, however, there is not more than one to a berry, though there may be a dozen in the ear. The worm or larva is yellow, and about half an inch in length; and, if the wheat is threshed immediately after harvesting, may, where it exists, usually be found in large numbers in the screen-boxes of the fanning-mill. When it leaves the ear, as it generally does before the wheat is cut, it falls to the ground, which it penetrates, and remains in the larva state until with the returning year it becomes a perfect insect, and renews its attack on the blossoming and earing grain. Perhaps no single insect has attracted more notice in this country, or caused more exertion to discover some method of destroying it or preventing its attacks, and, we regret to say, thus far with very little success. Much was expected at one time from the application of lime to the ear; but subsequent experience has not justified the hopes at first entertained. Perhaps, in some cases, the fault has been in the lime not being fresh or quick, as it clearly should be when applied; and perhaps the application was delayed so long that the mischief was already done, and the worm safe from the effects of the lime. Has sprinkling the ears, when attacked by the fly, with lime-water, ever been tried? We think such an application, of the proper strength, would be fatal to the egg or the worm, and might be disagreeable to the fly. Fumigating the field with sulphur has been recommended; and, could it be carried into effect at dusk, when there is a little dew on the grain and the fly the most active, there can scarcely be a doubt of its good effects. The sulphurous acid that would be thus generated would be fatal to flies, as experience proves it to be to bees and other insects when respired. We are inclined to think that, eventually,

fall ploughing of all lands where the preceding crop has been injured by the worm, will be found the most easy and effectual remedy, by destroying the insect while in the larva state, and thus preventing the appearance of the perfect insect. The same worm that is found in the wheat-head we the last year detected in oats, and it is well known to attack barley; so that it may be considered the general enemy of all the cereal gramina, and should be guarded against in all.

[The varieties of wheat are very numerous, and the experiments of Le Couteur prove that the number may be easily increased. Some of the varieties that have been introduced into cultivation lately are clearly superior to the old, both in their productiveness and the quality of their flour.

An interesting account of the successful conversion of a winter wheat into summer wheat may be found in the Genesee Farmer, vol. 9, page 138, and in the Cultivator, vol. 7, page 23. In this case the wheat selected was the flint-wheat, white-berried and beardless; the product of this, when grown as a spring wheat, is reddish and *bearded.*

That new kinds may be produced to take the place of such varieties as, by carelessness in cultivation or age, become deteriorated, is evident; and the United States should institute experiments in wheat as well as the countries of Europe. The Italian spring wheat has been a great acquisition to this state. The following notice of its introduction is from a letter to the editors from Mr. Hathaway, of Rome, the gentleman who brought it to the notice of the public.]

"I came in possession of the original wheat by accident. An Italian gentleman of Florence, married against his father's will, was disinherited, and emigrated to America, bringing, among a quantity of other seeds, a tierce of this wheat, as he intended to turn farmer. The wheat did not arrive seasonably for the spring sowing in this place, and was left in a storehouse on the canal. The gentleman contracted for a farm in the town of *Florence* in this county (induced by the *name*, probably), was no farmer, made bad calculations and worse experiments, and failed in everything; he soon became reduced, and was about to eat his imported wheat, for which I had advanced him money to pay the transit and charges. I happened to see it, and, being struck with its excellence, told him it must not be so disposed of; procured him other wheat, and took it at its cost in Italy, $2 50 per bushel. I succeeded in getting it into the hands of some of our farmers, though without much confidence on their part. But the result was most gratifying; the wheat actually producing about double the quantity usually grown on an acre, and selling at more than double the price of common spring wheat. From this it has all arisen."

CHAPTER VII.

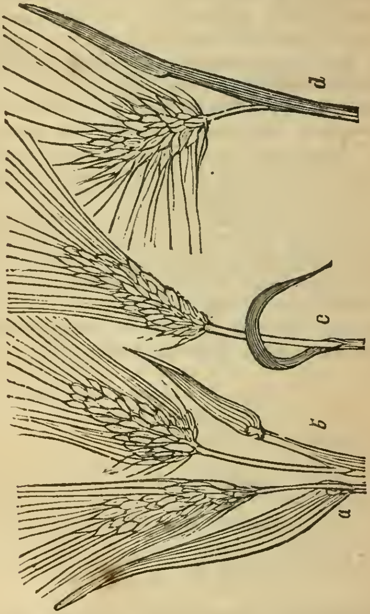
BARLEY AND OATS.

Varieties of Barley.—Best mode of Culture.—Varieties of Oats.—Suitable Soils.—Good Crops.

THE increasing attention which is paid to the cultivation of barley; the profits of the crop; its value as a preparative for wheat; and the favour which it finds as a substitute for wheat in making bread, are

entitling it to a high rank among the grains cultivated in this country.

According to Loudon, there are six species and sub-species of this grain in cultivation, besides varieties; but the following figures, copied from his Encyclopædia of Agriculture, exhibit the most important:



Hordeum vulgare, or Spring barley (*a*), is distinguished by its double row of beards or awns standing erect, and its thin husk, which renders it favour-

able for malting. This is the sort commonly grown in the southern and eastern districts of both England and Scotland.

Hordeum cœleste, or Siberian barley, is a variety of early or Spring barley much grown in the north of Europe, having broader leaves, and reckoned more productive than the other.

Hordeum hexastichon (*b*), Winter barley, or, as it is called in Scotland, square barley, is a variety known by having six rows of grains, large and thick-skinned, and for that reason is not considered as favourable for malting.

Barley bigg is a variety of Winter barley, known by its always having six rows of grains, by the grains being small and thick-skinned, and being earlier than either the first or last mentioned variety. It is hardy, and chiefly grown in Scotland.

Hordeum distichon (*c*), common or long-eared barley, is known by its long spike or ear flattened transversely, and its long awns. It yields well, though some object to it, as, the ears being long and heavy, they think it apt to lodge.

Hordeum distichon nudum, or naked barley, is known by the awns falling easily, and, when ripe, almost of themselves from the chaff, so that the ear somewhat resembles wheat, and by some is called wheat-barley. It is spoken highly of in the British Husbandry, as being hardy in growth, strong in the stem, tillering with great vigour, and producing abundant crops of fine grain. By some this variety is considered the same as spelt-wheat, which, indeed, it strongly resembles. It is six-rowed.

Hordeum Zeocriton (*d*), sprat or battledore barley, is known by its low stature, coarse straw, short, broad ears, and long awns. It is but little cultivated.

New varieties of barley are produced in the same manner as in wheat, by crossing; and some of the most celebrated kinds, such as the Chevalier, Annat, &c., have originated in this way.

In this country but two varieties are sown, and these are familiarly distinguished as the two and the six rowed. They are always sown in the spring, no kind being able to endure the severity of our winters; or, at least, we know of no variety which has been attempted in the United States as a winter or fall sown grain. The comparative value of the two varieties does not seem to have been fully decided by our farmers, some preferring one kind and some the other. That the two-rowed will make the most flour from a given number of pounds; that its thin skin renders it more suitable for malting; and that it is rather less liable to be affected by smut than the six-rowed, seems to be generally conceded; but its productiveness is much disputed, and, it would seem, with some reason, since the greater length of the ear in the two-rowed will hardly compensate for the greater number of rows in the other variety. So far as we are able to judge, however, from the opinions of experienced farmers, the preference, for the reasons assigned, is becoming more decided in favour of the two-rowed.

Barley of every variety requires a rich, friable, and mellow soil, which retains a moderate quantity of moisture, without approaching to what may be denominated wet; as, for instance, land containing from 50 to 65 per cent. of sand, and the remainder chiefly clay; though, in situations where the climate is usually moist during the summer, it may be grown where sand is in a larger proportion. It succeeds best in what farmers term a rich, deep loam; but a soil with too much sand or too much clay will not produce good crops. With the single exception that it will succeed with less lime than wheat, soils that produce good wheat will also grow barley to advantage.

It is probable that more barley is grown in the State of New-York than in all the rest of the United States; and the section in which it is produced in

the greatest abundance and perfection is the northern slope of Western New-York. The ranges of towns which mark the geological separation of the argillaceous and limestone districts have hitherto yielded the greatest quantities of barley; and in them the culture is still rapidly extending. On this slope it is found that soils on which winter wheat, without extra care in cultivation, is very liable to freeze out in the spring, will produce heavy crops of barley; and hence clover and barley on many farms have taken the place of clover and wheat, affording about the same profit in the crop, and at a less expense of labour. This is particularly the case in the country extending from the Oneida to the Canandaigua lakes, including a part of Madison, Onondaga, Cayuga, Seneca, Yates, and Ontario counties. On what is called the great limestone region of Western New-York, wheat will undoubtedly be preferred to barley as an article of culture; and it may be remarked as a general rule, that on all soils where good barley can be grown, the suitable application of lime will ensure the success of wheat.

Perhaps there is no crop which demands and repays thorough working of the soil better than barley. The surface, when fitted for the reception of the seed, can hardly be made too fine; and the excellence of the crop is greatly depending on this point. A crop that occupies the ground so short a time as barley, spring wheat, or oats, can hardly be benefited by manure applied directly to them, unless in a thoroughly decomposed state; and hence it has been found by experience that these crops succeed better after hoed or root crops to which the manure has been applied, or on turf-lands that have received a top-dressing of manure, and been carefully turned over in the fall of the year. The practice, somewhat extensively followed, of sowing winter wheat after barley, has led to the application of the manure

to the barley-crop; and perhaps, where hoed crops cannot precede, this is the preferable way, though there is a great risk of too much straw, and the consequent lodging of the barley before ripening.

Barley should be sown, in all cases, as soon as the ground is sufficiently dried and warmed to allow the seeds to germinate freely, and to place them beyond the danger of injury from frost. Early frosts are more fatal to barley than to spring wheat or oats, and more injurious on wet or low lands than on dry or elevated ones. Particular attention must be paid to the dryness of the soil at the time of sowing, especially if naturally inclined to be wet, as on such soils a wet spring will starve and destroy the plants. "Steeping the seed for twenty-four hours in soft water will cause the grain to germinate at the same time; and this, if it is sown at a late period, is of more importance than may be generally imagined, as it is otherwise apt to ripen unequally."—(*Brit. Hus.*) The finest, heaviest samples of all grains are usually obtained from early-sown fields; and the difference of weight in barley and oats is from one fifth to one third in favour of early sowing. The smut is the only disease to which barley is subject; and this is rarely a serious injury, where the crop is grown on favourable soils, and the seed is put in in good order. The worm which has proved so destructive to wheat in the Eastern counties, has also injured the barley to a considerable extent; but in Western New-York we have neither seen nor heard of its appearance in this grain. The wire-worm is sometimes very destructive to the crop when young; and some seasons the meadow-mole, so called, as the grain approaches maturity, makes sad havoc by cutting down the plant to get at the ears—an effect more often observed when the barley is sown on turf-leys, as these rarely lie so close as not to leave numberless hiding-places for the animal.

In sowing barley, as in most other crops, the uni-

versal experience of English farmers, and the directions of the best works on agriculture, go to establish the fact, that less seed is required on rich lands than on poor; and that the quantity of seed used should be increased in proportion to the lateness of the sowing. In European countries, from ten to eighteen pecks per acre are used—sixteen being the quantity usually recommended: in this country, from two to three bushels to the acre are considered sufficient. The two-rowed requires less than the six-rowed, as it tillers more vigorously; and, if sown too thick, the plants will be weak and ripen irregularly.

Both the quantity and quality of the product depend on the soil and on the variety of the grain sown. In this country, the average crop may be stated from thirty to thirty-five bushels per acre: in England, the average produce is estimated at thirty-two bushels. Middleton says the crop in that country varies from fifteen to seventy-five bushels an acre. The greatest crop we have seen mentioned in this country was sixty-five bushels per acre, and that was grown on land from which several crops had been taken in succession. In an experiment made by the East Lothian Agricultural Society upon the Chevalier and a common sort of barley, both sown on a light gravelly soil, the produce of each per imperial acre was, Chevalier, 65 bushels 2 pecks of grain, weighing 56 3-4 lbs. per bushel. Common barley gave 61 bushels 22 pecks of grain, and weighed 54 3-4 lbs. per bushel.

Good qualities of the two-rowed will average about 52 or 53 lbs. per bushel; but the winter or six-rowed varieties will not exceed 43 to 46 lbs. The difference in malting is great; the experiments of Dr. Smith showing that a Winchester quarter* of the several varieties, when malted, would produce the following quantities of proof spirits, viz.

* Eight bushels.

English barley about	21¼	gallons.
Scotch barley "	19¼	"
Scotch bigg "	16¼	"

Or that English barley was 11 per cent. superior to Scotch, and full 12 per cent. above Scotch bigg, or winter barley.

The value of the several kinds of grain as an article of food may be estimated from the following table, the flour being of good household or family quality:

Wheat, if weighing	60 lbs., gives flour	48 lbs., bread	64 lbs
Rye	54	42	56
Barley	48	37½	50
Oats	40	22½	30

(*Brit. Hus.*)

The analysis of barley by Sir H. Davy gives, as contained in 100 parts:

79 per cent. of mucilage or starch,
7 " of saccharine matter,
6 " of gluten or albumen.

Owing to the deficiency of this latter substance or gluten, barley flour, like that of oats, buckwheat, or potatoes, cannot by itself be made into bread, but is mixed with wheat flour, or eaten in the form of cakes, when it is very wholesome and palatable.

Barley is, perhaps, one of the most difficult grains to secure in good condition; as, if suffered to stand until the berry is perfectly dry and hard, the head will frequently drop down, owing to the brittleness of the straw; if cut too early, the grain will shrink and lose in weight; and as it cannot, when cut in an unripe state, be put into barns or stacks without certain injury by heating, so, in unfavourable weather, it is very apt to become of a black colour, and to lose the clear yellowish-white tinge so characteristic of good and well-cured barley. The unusually fine state of our atmosphere, and the clear, dry air of our summers, render the proper curing of barley a much less difficult task here than in the moist climate and under the cloudy skies of Great Britain.

Before the introduction of threshing machines, barley, though easily threshed by horses or by hand, was with great difficulty prepared for market, owing to the obstacles offered in separating the awn from the kernel; and, at the present time, in many districts of England and most parts of the Continent, the *hummeling*, or freeing the berry from the beard, is one of the most laborious and difficult processes in the culture of barley.

Barley is extensively used in the fattening of pork, for which purpose it is admirably adapted when prepared by steaming or grinding; and, in the districts where it is grown, is an excellent substitute for the corn-crop, which for a few years past has been a partial failure. It is also used in large quantities in our breweries, and in too many instances takes the place of rye in the manufacture of whiskey. As a feed for horses it is not generally approved of; but for fattening cattle, hogs, and poultry, it is highly prized. Before the system of cutting straw, or manger-feeding, was generally adopted in Great Britain, barley-straw, owing perhaps to its being cut early, was used as food for cattle in preference to other kinds, as they could eat it uncut more readily than the harder straws. Wheat or oat straw is now preferred, when it is to be converted into chaff or cut fine, for mixing with hay or roots. There are two varieties of barley found in the shops, Pearl and Scotch, both of which are prepared by divesting the kernel of its husk in mills resembling in some degree the rice mills of the South; and in the case of the pearl barley, the grinding or rubbing is continued until the berry assumes a smooth, round form. Few articles are more nutritious, or better adapted to the stomachs of the weak or valetudinarians.

OATS.

The oat, *Avena sativa* of the naturalists, is a very useful grain, and better adapted to a northern cli-

mate than any other plant that has been used for bread. It is chiefly confined to the more moist and cool portions of the American and European Continents, being scarcely known in the South of France, Italy, or Spain, in the Southern parts of the United States, or in tropical countries. Of all the cultivated grains, oats are the easiest of culture, and the most certain and prolific in their product. The varieties are very numerous, and some of them very distinctly marked; and, as in the case of wheat, there seems no reason why new varieties may not be produced at pleasure.

Mr. Loudon, in his Encyclopædia, enumerates the principal varieties cultivated in Scotland as follows; and from his work we have copied the representa-

tions of two of these varieties, illustrating the most marked peculiarities of this valuable plant.

The white or *Common oat* (*a*), in most general cultivation, and known by its white husk and kernel.

The *Black oat*, known by its black husk, cultivated in England and Scotland on poor soils.

The *Red oat*, known by its brownish-red husk, thinner and more flexible stem, and firmly attached grains. It is early, suffers little from winds, makes good meal, and suits exposed situations and late climates.

The *Poland oat*, known by its thick white husk, awnless chaff, solitary grains, short white kernel, and short, stiff straw. It requires a dry, warm soil, and is very prolific. The black Poland oat is one of the best varieties, and sometimes weighs 50 lbs. per bushel.

The *Dutch oat* has plump, thin-skinned white grains, mostly double, and the large one sometimes awned. It has longer straw than the Poland, but in other respects resembles it.

The *Potato oat* has large, plump, rather thick-skinned white grains, double and treble, and with longer straw than either of the last varieties. It is preferred to all others in England for land in good cultivation, and bears a higher price in the London market than any other.

The *Georgian oat* is a large-grained, remarkably prolific variety, introduced from Georgia, near the Caspian Sea. Some cultivators on good land prefer it to the potato oat.

The *Siberian* or *Tartarian oat* (*b*) is considered by some as a distinct species. The grains are black or brown, thin, and rather small, and turned mostly to one side of the panicle or ear. The straw is large and reedy, but it is usually very productive, and is well calculated for poor soils and exposed situations.

A variety called the *Winter oat* is cultivated in some parts of England. It is sown in October; the plants are luxuriant at Christmas, tillering like wheat; it is depastured by ewes and lambs all the spring; the fields are then shut up, and an ample harvest is cut in August.

There are many other varieties of oats known, the names of which are derived from some local

cause, and by selection or systematic impregnation new kinds may be originated at pleasure. Degeneracy in any variety usually takes place in a limited time, unless care is taken to select the best heads and well-ripened grains for seed. Some English farmers are at the pains to select the best seeds after the grain is threshed.

It is found by experience, that of the numerous cultivated varieties, the Potato and Poland are the best selections for lowland, and the red oat for good uplands; the common or the black oat may be sown on inferior soils, as may also the Tartarian. The numerous instances given in the Farmer of the astonishing productiveness of the Tartarian, show that it is a variety well adapted to our soils and climate.

In the sowing of oats, less regard may be had to soil than with any other grain: the only requisite seems to be that it is not too wet. Tenacious clays or poor gravel, where scarcely any seed-bearing plant will grow, will produce a crop of oats if ploughed at the proper season, and if the seed be of good quality and judiciously put in. "The best oats, both in quantity and quality, are those which succeed grass; indeed, no kind of grain seems better qualified by nature for foraging upon grass-land than oats; as a full crop is usually obtained in the first instance, and the land left in good order for the succeeding ones."—*British Husbandry.*

In England the time of sowing oats is from February to April; a proof of the great disparity existing between the climate of this country and that; since here, oats are sown from the last of April until June, very few being usually put in during the month of April. It should always be remembered, however, that early-sown oats, as well as spring wheat and barley, are always heavier and of better quality than late-sown, and, as a general rule, all spring grains should be put into the ground as early as the soil can be prepared for their reception.

As with other grain, the quantity sown per acre varies much with different agriculturists and in different countries. Here, from two and a half to three bushels to an acre are considered amply sufficient: "in England, from four to six bushels are usually sown."—*Loudon.* A less quantity of potato oats is required to be sown than of other varieties, as they tiller better, and, having no awns, give a greater number of grains to a bushel.

Oats require and receive no after-culture, unless it may sometimes be necessary to go over a field and pull up such weeds as threaten to overrun the plant, or prove injurious by seeding to after-crops. There are few of the plants cultivated as grains so little liable to injury from insects or disease as the oat. The wire-worm sometimes attacks the plant in the ground; and we have in one or two instances detected in the oat the worm that is now proving so injurious to wheat. The disease to which oats are most liable is the smut. This may in general be prevented by sowing seed of good quality, and putting it in when the ground is dry and in good tilth. According to Loudon, liming oats or barley, which is so effectual in destroying smut on wheat, is useless. This may, perhaps, be owing to the husk, which prevents the immediate contact of the alkali with the kernel. Would not soaking the seed in lime-water obviate this difficulty, and secure the plant against this disease? The mode of preventing the ravages of the wire-worm practised in Europe, is to plough the land immediately before sowing. If it be in grass, the worm is turned under, and, before it works its way to the surface, the grain is beyond its reach. In this country, late ploughing, by exposing the larvæ and eggs of insects to the action of frost, has been found one of the most effectual means for their destruction.

The great danger to which late-sown oats are exposed, is the being overtaken with frost before the

grain is ripe. The result is an inferior light grain, unfit for seed, and of little value for meal. The great difference of weight between good and poor oats is principally in the meal, as the husk of immature is equal to that of ripe oats. Fortunately, frost-bitten oats are easily detected. The Rev. Mr. Farquharson observes, in the 19th vol. of the Farmer's Magazine, "that every oat-kernel, when stripped of the husk, will be found to exhibit the appearance of a groove on one side. If the bottom of the groove has a clear, translucent appearance from end to end; if it is not much shrunk into the substance of the kernel; and if the kernel splits with difficulty in its direction, then we may pronounce the vital part of the seed to be safe from the action of frost. If, on the contrary, there is a black speck seen in the groove at the root end of the kernel; if the groove cuts deep into the kernel, so that it may be split in that direction; and if, when so split, the blackness, accompanied by a rotten, scaly appearance, is seen extending from end to end at the bottom of the groove, then the vital part, or future plant, may be pronounced as being entirely unfit for seed."

Oats are extensively used for human food in Scotland and some parts of England, and in some few instances during the past season, oats were so used in this country. Generally, however, they are cultivated almost exclusively for horses, there being no grain which agrees with this useful animal so well, or which can be so cheaply furnished. Oats, when cut in a rather green state and well cured, fed out to sheep or calves, without threshing, in small daily quantities, have been highly recommended by some intelligent practical farmers. A mixture of oats and pease sown together, at the rate of two bushels of the former and one of the latter to the acre, has been adopted by some farmers, and are considered preferable to clean oats for feeding. They require grinding, of course, and must be better,

when required for mixing with boiled food for swine, than oats alone. The trouble of harvesting, however, must operate as a drawback on this mode of culture, as the crop is almost invariably lodged; and as it can neither be raked as pease nor cradled as oats, it must be cut with a scythe, which is usually a tedious and wasteful process.

Although oats will succeed on ordinary soils, and with less care than other crops, still good culture is as well repaid with this as with other grains. The southern tier of counties in New-York have produced some of the largest crops of oats on record; and the quantity annually grown in this state is immense. As examples of good crops, we annex two communications from the Genesee Farmer for 1838.

In answer to your inquiries, the land that the oats grew upon is gravelly loam; but very little gravel, however. In 1830, I put a small coat of barnyard manure on the land, ploughed, and planted it to corn. The year following I sowed it to oats, and stacked it down, and put on about 1 1-4 bushels of plaster to the acre. The three years next following I used it for pasture. The first year of pasturing I used about 1 1-4 bushels of plaster to the acre. In 1836 I ploughed it shallow, dragged it well, and planted it to corn. I had a great growth of corn, but the early frost very nearly destroyed it. In the spring following I split the hills as usual, and dragged it well. About one third of the lot is quack land (we suppose land infested with quitch-grass), which I ploughed three times after harrowing, the rest but once. I sowed my oats, 2 1-2 bushels to the acre, and harrowed the quack part well six times, the other part four times. I sowed 1 1-2 bushels of plaster to the acre immediately after the oats were up. One thing I consider very essential in order to keep land in good heart: when I till it, I till it well; and when I

use it for pasturing, I do not overstock it with cattle or sheep, in order that my land shall have a good coat of grass left on it in the fall, to keep it warm through the winter, and serve for manure. The oats weighed 35 3-4 lbs. to the bushel. One thing I would mention: every time I ploughed my quack land, I applied the harrow immediately after.

JONAH A. HURLBERT.

Great Barrington, March, 1838.

GREAT CROP OF OATS.

In your August number of the Monthly Genesee Farmer, I see that Mr. Jonah A. Hurlbert raised 91 bushels of oats to the acre. This looks well for old Berkshire county; but, to show our sister State of Massachusetts that the county of Livingston has done a little more, I will give you the product of nine acres of Flats on the Genesee River. Last year I sowed nine acres of Flats with oats, one half of the side of Tartarian oats, and the other half of the common oats, mixed when sowed; and I took off from these nine acres *nine hundred bushels* of oats, well cleaned, and all of the first quality, which, you see, is 100 bushels to the acre, and nine bushels to the acre more than Mr. Hurlbert had.

A LIVINGSTON COUNTY FARMER.

August, 1838.

CHAPTER VIII.

PRINCIPLES OF BREEDING.

Effects of Crops.—Tendency to Deterioration.—Relative Size of Animals, Male or Female.—Constitutional Ailments.

The attention of farmers has of late been turned to the improvement of their stock by the introduction of pure-blooded animals into the country; and the subject is one which vitally affects their interest, and should be well understood by them. The extension of the alternate system of husbandry, while it will not lessen the quantity of grain grown, will afford the means of greatly adding to our stock of cattle, and render apparent the necessity of paying more attention to the principles upon which breeding can alone be profitably conducted.

There are multitudes of farmers practically acquainted with raising cattle (and our remarks will equally apply to horses, sheep, &c.), who, unacquainted with the laws which govern propagation, and the mixing of blood by crossing breeds, know not how to determine the increase or deterioration of pure blood that will result from employing two animals of different breeds. Having a superficial knowledge of such breeds, but unacquainted with the principles that determine their origin and contribute to their preservation, it is not to be wondered at that mistakes in management should occur that defeat their purposes, and which have, in some cases, the effect of preventing any farther attempts at improvement.

Farmers understand that, by coupling a pure-blood Short Horn with a cow of our common or ordinary

race, the offspring will be *half breed;* they farther understand, that, by the union of this *half-breed* heifer with the same father, or with another pure Short Horn, a progeny three quarters blood will be produced; but there are many who do not understand, or, rather, never have inquired, how it is that they have not pure blood in the third or fourth generation. It is at these points of gradation in breeding that interested or dishonest dealers in animals begin to take advantage of the ignorance or inattention in farmers to which we have alluded; and many an animal is palmed off for good blood that a little care or examination would show to have small pretensions to such a distinction. Pure blood is talked about loudly, when perhaps neither the buyer nor seller comprehends the real proportion of pure blood existing in the animal.

All acknowledge the principle, that from the union of two individuals of different breeds, one pure blood and the other common, half-blooded animals will be the result. From this starting point a scale may be drawn, by which we may determine the degree of pure blood that any generation, however distant, will possess, or the proportional quantity of pure and common blood which flows in the veins of a bull or horse whose progeny is known. Recourse to figures and examples will perhaps make this more plain; and we shall for this purpose avail ourselves of the tables prepared by Count Montendre for the French sporting paper *Le Journal des Haras.*

We will, for example, take one of Mr. Allen's or Mr. Rotch's beautiful Improved Short Horn bulls, and, as he is of pure blood, we will call him A., expressed in figures by 1. The cow shall be of the common native kind, and called B., and her value in blood 0. The calf produced by the union of these two is characterized by the letter C., and is composed half of the father and half of the mother, deci-

mally expressed thus: $\frac{1+0}{}= 0.50$, or $\frac{1}{2}$. C. is a heifer, and is put to another pure Short Horn, when the calculation will stand thus: $\frac{1+0.50}{}$, or $\frac{1.50}{2}=.75$, or three fourths pure blood. We will now proceed to another generation. The progeny is still a heifer put to a pure Short Horn, as before; and the result will be now as follows: $\frac{1+0.50}{2}$, or $\frac{175}{2}=.875=.7$ pure blood. The fourth generation, the same course being pursued, will stand thus: $\frac{1+0.875}{2}$, or $\frac{1.875}{2}$ $=.9375$, or $\frac{15}{16}$. The tenth generation would give, as the reader may work out for himself, if he pleases, $\frac{1023}{1024}$ pure blood; and the twentieth generation would possess $\frac{1048525}{1048576}$ of pure blood; or, in other words, an animal of the twentieth generation, in one million, forty-eight thousand, five hundred and seventy-six parts of blood, would have one million, forty-eight thousand, five hundred and twenty-five that was pure; and though, by farther progress, we should approach nearer and nearer the unit that represented the bull, it would never be quite reached. The deficiency would indeed be slight, but the pure blood could never be attained or absolutely reproduced; and this fact, though apparently of little consequence, is of vast importance to the breeder, and should be always kept in mind.

It results from this mathematical demonstration of the effects of crossing in breeding, or breeding from pure and common animals, that every breed brought to a certain state of excellence by a succession of improvements, may sustain itself in this state without having recourse to the pure breed from which it was derived, and in which were its first principles of improvement. All that is necessary in

breeding is to employ animals of both sexes uniting the highest qualities of the improved race; but there are always difficulties attending the conservation of such a race, and, without the greatest care, a deterioration from this elevated point will soon be visible.

The cause and reason for this tendency to deterioration must be sought in the impure blood which necessarily exists in every deviation from an original stock. Notwithstanding the value of the cross—although it may approach the pure race to within the minutest shade—still it carries in its blood, derived from its mother, an indestructible germe of debasement; always ready to develop itself by little and little, under the operation of local influences; always modifying the general economy and constitution of the animal, until, at length, by alteration of form, and changes in the qualities and disposition of the animal, it is evident that the type of the male parent is effaced, and a reproduction of that of the mother, with all its characteristics of inferiority, is complete.

It is clear, therefore, that though, by extraordinary care and attention, an improved breed of animals may be kept at any degree of excellence by selecting the best animals of the race to propagate from, the breeder acts wisely, who occasionally regenerates his improved stock by crossing it with pure-blood from the original race, without any ignoble mixture or impure stain. The observance of this rule appears to have constituted the secret of the Rev. Henry Barry's unequalled success in breeding improved Short Horns; and a recurrence to it will, we think, be found necessary by every one who is engaged in rearing the best animals of any breed.

If a half-breed bull is put to a cow of the same grade, the character of the progeny would, according to the mathematical calculations we have made, appear to be $\frac{050+050}{2} = \frac{102}{2} = 0.50$; that is, the

calf would be of the same blood as the parents, or half and half. But experience shows that such will not be exactly the case. The tendency to degradation is operative; and to rate such a progeny at 0.50 would be higher than the actual value. This result implies no contradiction to the foregoing rules; on the contrary, this certain lowering of the standard of purity shows that the pure blood is the essential ameliorator, and that it is obliged at once to overcome the positive resistance offered by the inferior blood, and the continual tendency to return to the original native type. It farther proves, that part of its power is annulled by the single fact of its being mingled with blood less rich; and that by this its agency is essentially modified, and its efficiency diminished. Local influences are therefore opposed to the success of such a cross; the inferior blood is probably indigenous to the country, and the constitutional tendency is in favour of the lowest standard of blood.

It is by applying this course of reasoning to crosses which have been made between the improved Short Horns imported into this country and our original native cattle (the superior grades of which crosses are, by the inexperienced, considered as of about equal value to the thorough-bred animals), that we shall perceive the difficulty, stated before, of keeping up the purity and value of any created breed by selection from that breed alone. The seeds of degradation are there; and a degree of vigilance, care, and *judgment*, which but few breeders of cattle can be supposed to possess, is required to prevent the retrograde tendency. The degeneracy may be slow, the good blood in the race may retard, but, for the reasons given above, it cannot wholly arrest the progress downward. An occasional, and, perhaps, not unfrequent infusion of the original pure blood can alone do this.

When once the work of deterioration has com-

menced in a breed of animals, and no recourse is had to the method which is alone effectual in arresting its course—the mixture of pure blood—the degradation will proceed with annually increasing rapidity. The best stock of breeding cattle or horses in the country may be irreparably injured by the slightest accidental mixture of blood in the least degree impure. The same table that demonstrates the improvement of a breed, when proper care is paid to the breeding, will prove the rapidity with which the same breed must deteriorate when left to the agency of degrading causes. Suppose the cattle-breeder has a cow that has reached the purity of blood we have given to the twentieth generation, crossed by a bull of no breeding: at the fourth generation there will be only 1-16th part of pure blood remaining; at the tenth, not a thousandth part; and at the twentieth, not a millionth part.

There are many farmers who imagine they have laid the foundation of an improved stock when they have procured a half-breed bull or cow, or perhaps two half breeds to commence with. But these half breeds will not in the next generation produce stock like themselves, no matter how nearly the parents may resemble each other. The progeny will resemble the remote ancestors on one side or the other, as the original blood happens to predominate; and, instead of having, as he hoped, a new race of his own, the farmer will find he is possessed of several races, only resembling each other in the general fact that they get rapidly lower in the scale of excellence in each generation. The reasons for this result have been assigned above. A continual recurrence to pure blood can alone give certainty to improvement.

In breeding, somewhat conflicting opinions are entertained as to the relative size of the male and female; some breeders contending that in all cases the female should be the largest, as affording more

room for the development and nourishment of the fœtus. Cline, Lawrence, Cully, and other celebrated names are the advocates of this principle; and, we think, of its general soundness there can be little doubt. It has, however, found strenuous opponents in England; and these objections have been urged with much force in an Essay on Cattle, from the pen of an eminent cattle-dealer and breeder, John Weight, of Chesterfield. Mr. W. assumes as the basis of his argument, that the male and female are of equal blood, and of similar qualities in all respects, size excepted; and here the male is much the smallest, according to the system of Cline and Cully. As a natural result, the progeny will be of a size intermediate between the two, and, according to Mr. W., in a continually increasing ratio. "For instance, by beginning to breed from a cow, of which the average weight of the herd, taking it to be uniform, is 70 stone,* and from a bull of a herd, of which the average weight is 65 stone, the female produce will be an average of 67 1-2 stone. Observe, *it is not the weight of the bull himself, but the average weight of the race of cows from which the bull is descended, that should be the groundwork of calculation.* Again: the heifer-calf, bred as above, will, when old enough, according to this principle, be put to a bull of a herd of cows five stone less on an average, and the next generation will have decreased to 65 stone. So that, in the course of a few generations, the original improved stock will be reduced to such a degree, that little will remain to distinguish it from some herds of small and inferior cattle, except colour and the other characteristics of the species, independent of size." Here the case is stated in the strongest manner, and under circumstances that can scarcely occur in practice; breeders, therefore, must determine how much weight is to be allowed to the argument.

* A stone is fourteen pounds

Opinion, in the breeders of both cattle and horses, seems to incline to the practice of selecting animals for breeding more with reference to certain desired qualities than to size; certainly this has been the case with the breeds of improved Short Horns and Devons; though, owing to superior care and keeping, an evident improvement in size as well as quality is manifest. In no race of cattle is the difference between the size of the male and female more marked than in that of the Devon, the bull occupying a middle place in size between the ox and the cow, the latter being the smallest of the three. On the contrary, in some of the other English races of cattle, the male and female are of nearly equal size; or the advantage, if any, is on the side of the female. It would seem, therefore, that more stress has been laid on the point of size by theoretical, and perhaps by practical men, than it has deserved; and that the great matter at issue is the purity of blood in the animal or in the cross.

Reasoning from the nature of the case, it would seem that the bull and cow should be nearly of the same size; or that, if there is any difference, the advantage in size should be on the side of the female. If the male is much the largest in stature, the offspring will be weak-bodied and leggy. If the male is the smallest, the progeny will be compact, heavy-bodied, and tough; though a very great disparity on this side will produce animals far from beautiful. Extremes are here to be avoided; and if attempts are made to modify the size of animals by breeding, care must be taken not to lower the purity of blood in effecting this object. Many fine stocks of cattle and horses have been nearly ruined, both in England and in this country, by an injudicious attempt to ingraft upon a breed of high blood some desirable quality of a low-bred race. As an instance, we may give one that occurred in Virginia a few years since, related by a writer in the Southern Agriculturist.

A Canadian pony that acquired some notoriety, "though scarcely thirteen hands high, was put to some of the largest mares in the country, some of them sixteen hands high. The result was a progeny of long-bodied, lizard or short-legged, squat animals, with diminutive extremities and immense frames, the very caricatures of the animals wished, and the blood of which was not for a long time eradicated." It is a law of nature, that her system of proportions, as well as races, cannot be violated to any extent with impunity.

If breeders of cattle wish to produce a particular effect in crossing or improving a breed, they usually pay more attention to the qualities of the cow than the bull; and the reason is, the young of all animals partake more of the qualities of the mother than of the father; her constitution, her temper—in short, all that is particularly good or bad about her, will, in nine times out of ten, leave its impress on the offspring. Experience shows it to be so in the human race; and it is not less decisively so in the ox or the horse. Constitutional ailments are more apt to effect the young when they exist in the female parent, and the cause is perfectly obvious: for no inconsiderable part of their existence they form an integral part of herself, and for another part derive their food, with all its good or bad qualities, directly from her.

There is another thing of much importance in breeding perfect animals, which is usually wholly overlooked by breeders of horses or cattle; and that is allowing, or, rather, requiring too much service from the male. In England the best bulls are let to only a limited number of cows: here, on the contrary, little or no attention is paid to this particular. The best and most vigorous stallions will rarely sire more than 70 or 75 foals in a season; yet they are frequently allowed twice or thrice that number of mares. Thirty ewes is the greatest number that

should run with a buck; yet here it is not uncommon to allow double that number. The best cattle the best horses, and the best sheep, will usually be found in the hands of breeders who do not overtask their males, or allow them to commence the work of procreation too early. There is probably no race or breed of animals so faultless as to render it proper to breed from any one of the race without selection. The Improved Short Horn approaches nearer that standard of excellence than any others; but observation and experience show that even here there is ample room for choice, and for careful, judicious selection. Animals are not unfrequently selected for breeders when so young that no correct judgment can be formed respecting them. Those that come to maturity early may be so chosen with safety; but a colt or a calf cannot be confidently decided on until two or three years old. The colt or the calf that gets the most milk while running with the mother will be usually considered the best, but, not unfrequently, erroneously. The cow does not come to maturity before her fourth or fifth year, and the horse still later; and to decide on the milking qualities of the first while suckling the first calf, or on the form and spirit of the last while they are yet undeveloped, is most absurd.

CHAPTER IX.

CATTLE.

Improved Short Horns.—Origin.—Milking Properties.—Herd-book.—Devonshire Cattle.—Description and Weight of Beef.—Milk.—Herefords.—Long Horns.—Ayreshire and Galloways.

No apology can be necessary for calling the attention of our readers to the subject of cattle, and the necessity of adopting the best breeds introduced from abroad for our pastures and dairies. It costs but little more to keep a breed of cattle that will weigh from seven to ten hundred at two years old, than it does a kind that must be three or four years old to reach the same weight. Size, beauty, quickness of motion, rapidity in fattening, and great milking qualities, are rarely found combined in the same animal or the same breed; and one of the reasons, perhaps the greatest, is, the attention of the breeder of cattle to a single excellence, by which other valuable properties are lost sight of, and perhaps destroyed. "It is unquestionably true, that every perfection in cattle—whether it be of form, of quality of flesh, of disposition to fatten, or to yield milk—can be promoted and retained solely by the breeder's devoted attention to his particular object; and if one object be allowed a paramount importance in the breeder's estimation and practice, other objects will suffer in proportion as they are neglected."* But it does not hence follow that a breed of cattle may not be produced which shall combine the greatest number and greatest degree of good qualities which can be compatible with uniform excellence; and in the

* Rev. Mr. Berry's Treatise on Short Horns.

opinion of the best judges and breeders of cattle, both at home and abroad, the point of uniform goodness in all the qualities desired to make cattle valuable has been nearer approached in the *Improved Short Horns* than in any other breed.

In our remarks on the subject of cattle, we shall avail ourselves of the best authorities within our reach; and, owing to the enterprising spirit and good sense of citizens of our own and other states, we are not without as fine specimens of the best improved breeds as can be shown abroad, to direct the opinion and inform the judgment: but, in comparing the several breeds, we must look abroad for estimates founded on actual experiment; and, as a writer on cattle, none stands higher than the late Rev. Mr. Berry, who, by his skill in selecting and judgment in breeding, has raised the Short Horn to its present proud pre-eminence.

It will not be here necessary to trace the history of the several breeds from which the Short Horns, in their improved state, are descended; those who wish for information on this topic are referred to the fourth volume of the Genesee Farmer, to British Husbandry, British Cattle, or the masterly treatises of the Rev. Mr. Berry. It is sufficient to state that Mr. Colling is considered as the founder of the *improved* Short Horns; that this improvement was principally effected by the means of his celebrated bull "Hubback;" and, in the language of Mr. Berry, "As we have at present no superior horse on the turf which does not boast the blood of the Godolphin Arabian, so it may be asserted that we have no superior Short Horns which do not claim descent nearly or remotely from Hubback."

In breeding his cattle, the great object of Mr. Colling was to retain the many excellent qualities of the old Teeswater, or Short-Horned Durham cattle, while he reduced their ungainly size and gave symmetry to their form. This he succeeded in doing by a cross

with the *Polled Galloway*, a breed with deep massive bodies and short legs, and well calculated to bring the tall Teeswaters nearer the ground, and add weight, firmness, and hardiness. "He was much favoured by circumstances in promoting his object, which was to take one cross, and then breed back to the Short Horn—the only course, by-the-way, in which crossing can be successfully adopted. To breed from the produce of a cross *directly among themselves*, will lead to the results which have induced many persons, without due consideration, to believe conclusive against crossing; but to take one cross, and then return and adhere to one breed, will, in the course of a few generations, be found to stamp a variety with sufficient certainty."*

The principle of crossing here laid down we consider of very great consequence, as it is the only one by which a good quality can be introduced and made permanent in the variety. It is the only one by which the excellence, be it form, maturity, or milking, can be rendered habitual in the breed, and become, instead of an accidental quality, a part of the constitution, and typical of the race. Attention here can perpetuate any desirable quality to the greatest extent; and the experiments of Mr. Culley, Mr. Berry, and others in England, have demonstrated the soundness of the theory. Early maturity and aptitude to fatten were the grand objects of the early breeders of the Short Horns; and on these points they succeeded to a degree of perfection which left nothing to be desired. Early maturity is the distinguishing characteristic of the Short Horns; and their capacity to continue growing, and, at the same time, attaining an unexampled ripeness of condition at an early age, has excited the wonder and obtained the approbation of all not blinded by unworthy prejudices. To illustrate this property of early maturi-

* Mr. Berry, British Cattle.

ty, and show the great advantages gained by adopt ing a breed affording such results, we shall give from Mr. Berry a few instances of animals fitted for the butcher, their age and weight.

A steer, bred by Col. Cooke, of Ouston, near Doncaster, fed on potatoes and straw, was slaughtered when 2 years and 22 days old; his quarters weighed 72 stone, or 576 lbs.

Mr. John Rennie produced at the East Lothian Agricultural Society meeting, a steer two years and four months old, whose four quarters weighed 153 stone 7 lbs. (1231 lbs.); also a steer three years and six months old, whose quarters weighed 1359 lbs., and the tallow 241 lbs. The same gentleman exhibited a steer between 18 and 20 months old, the quarters of which weighed 118 stone 1 lb. (944 lbs.).

Mr. Robertson, near Berwick-upon-Tweed, furnished Mr. Berry with a statement of a number of Short Horns fed by him on turnips, whose weight was as follows:

A steer, three years and a half old, four quarters 1862 lbs., tallow 294 lbs.

A steer, 3 years 10 months old, four quarters 1736 lbs., tallow 238 lbs.

An ox, four years and a half old, four quarters 1890 lbs., tallow 295 lbs.

Mr. Arrowsmith entered for a sweepstakes a twin heifer calved in April, to be shown in June, when she would be two years old. She was fed through the winter on turnips and hay, with 400 lbs. of oilcake, and was turned out to grass in May. On the 23d of July she weighed 58 stone, having gained 30 stone in 30 weeks. (Weight, 812 lbs. Gain in 30 weeks, 420 lbs.)

These instances demonstrate their peculiar character of fattening early; and that they may be made to combine the qualities, hitherto considered incompatible, of good feeders and good milkers, he experiments of Mr. Berry, as well as of breeders in this

country, clearly show. It was found, as the qualities of the improved cattle became more developed, that, in a too exclusive regard to form, and propensity to fatten early and easily, the important property of good milking had been neglected, and that in this respect they were inferior to some other varieties of English cattle. The qualities of form and fattening had become habitual; the object now was to ingraft on these the property of good milkers. In this improvement, which was completely successful, Mr. Berry took the lead; and as the principle he adopted is capable of application in other cases, it may be well briefly to sketch his process.

For nearly 100 years, a variety of the Teeswater, on the Tees, had been noted for its superiority as milkers; and as in form and propensity to fatten they bore a short resemblance to the Short Horns, Mr. Berry determined to select an animal of this breed for his experiments. He accordingly chose a bull from one of the best milkers in the district, and whose properties in other respects were such as to justify the decision. The result verified the correctness of the theory, and proved that, without materially diminishing their value in other respects, the properties of the Short Horns as milkers might be greatly improved. Crosses, with this object in view, have since been repeated, and, where conducted on correct principles, have rarely failed of benefit. "While on this subject, it is, however, proper to observe, that the excessive quantities of milk obtained from the unimproved Durhams or Short Horns are seldom or never obtained from the improved; but a moderately good milker of the latter kind will be found to yield as much *butter* in the week as one of the former, the milk being unquestionably of very superior quality; and, indeed, it was likely such should be the case, and that the change in the animal economy which leads to an excessive secretion of flesh should be productive of other rich secretions."—*British Cattle.*

It was by cautiously adopting the principle above laid down that the London dairies have been furnished with the superior animals for which they are distinguished. These cows were formerly the Yorkshire unimproved Short Horns; and, on account of their milking qualities, were great favourites with the dairy and milkmen of the metropolis. They had one serious fault, however, and that was difficulty of fattening; and, after their milk season was past, the dairyman was obliged to dispose of them for what he could get, as feeding them long enough to make beef was with him out of the question. Some of the best of these Yorkshire milkers were crossed with the improved Short Horn bull, and the breed thus produced retain most of the grazing or fattening qualities of the improved, while the excellences of the old breed for the pail remain unimpaired. Whether milked only a year, or, as is sometimes the case, three or four, as soon as they are dried, they fatten as rapidly as the best of the improved breed.

We regard the establishment of these principles in regard to crossing (and they have also been adopted with regard to the Devon) as of great importance, and as proving most conclusively the practicability of ingrafting any desirable quality, and then rendering it constitutional and permanent. As a proof that the improved Short Horns are not inferior in dairy properties, we give the following statement from the work on Cattle published by the Society for the Diffusion of Useful Knowledge. The experiment was made by Mr. Calvert, of Sandysike; the milk of the cow was put by itself, and an accurate account of the butter produced weekly kept for the time stated. Each week gave as follows: 7, 10, 10, 12, 17, 13, 13, 13, 15, 16, 15, 12, 13, 13, 13, 14, 14, 13, 12, 12, 13, 14, 12, 10, 10, 8, 10, 9, 10, 7, 7, 7: total, 373 lbs. of butter in 32 weeks. She averaged 20 quarts of milk a day for 20 weeks; the greatest quantity in a day being 28 quarts. The pasture was

by no means of a superior quality. This instance of dairy excellence is pronounced "not a singular one" in the work alluded to; but all will allow, we think, that such products cannot be found anywhere except among the very best cows. Instances of great yields both of milk and butter for a single week are on record in this country, from the improved and the common kinds of cows, but we have met with no account, properly authenticated, equal to the above the season through.

Some farmers in England have asserted, and the opinion has been advanced in this country, that the Short Horns are not fit for work. The correctness of this may well be doubted. We know of no instance where the improved stock have been used as *oxen;* they command too high a price as bulls to be condemned to the yoke; but instances have occurred in which the bulls have been worked on the farm, and, as was to have been expected from their disposition, they proved perfectly docile and manageable. To the above objection an English writer replies: "They work admirably; but, surely, cattle which are fit to go as profitably to the butcher at two years old as any other breed at three or four, ought never, as a general rule, to be placed in the yoke. No beast, in the present advanced state of breeding, ought to be put upon a system which arose out of the necessity of obtaining compensation by work for the loss attending a tardy maturity."

The portraits of the celebrated bull Comet (fig. 1, p. 134), bred by Mr. C. Colling, and of Viola (fig. 2, p. 135), bred by Mr. J. Whittaker, both animals of the best blood and points, will render unnecessary any comment on their form. The colours of the Short Horns, the *improved* variety, are red or white, or a mixture of the two, combining in endless variety, and producing very frequently a fine effect. The white, it is very probable, they obtained from an early cross with the white or wild breed; and wher-

ever this colour shows itself, it is accompanied with a red tinge, more or less, on the extremity of the ear: a distinctive characteristic also of the wild cattle. *No pure improved Short Horns are found of any colours*

Fig. 1.

but those above named. This should be remembered: for there are Short Horns of the unimproved kinds, black, pied or black and white, blue, and dun, and of all shades, and there can be no doubt that multitudes of these inferior animals, or crosses with them, are finding their way to market as the pure improved breed.

We may add here, as giving some hints that may be useful in the selection of dairy animals, a maxim much relied on among the London dairymen; and some doggerel lines, descriptive of a good cow, from the Farmer's Magazine. "A milch cow, good for

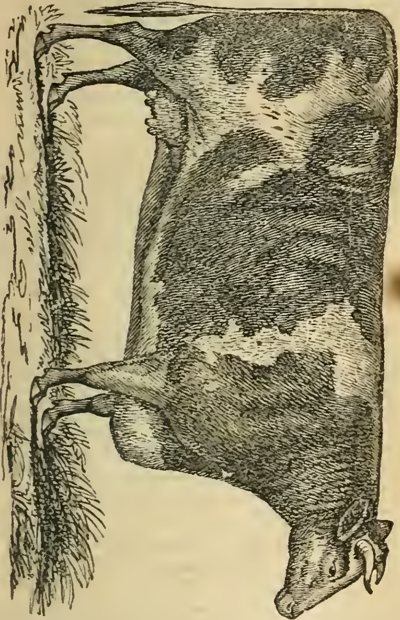


Fig. 2.

the pail as long as she is wanted, and then quickly got into a marketable condition, should have a long and rather small head. *A large-headed cow will seldom fatten or yield much milk.*" Of a good cow it may be said,

"She's long in her face, she's fine in her horn,
She'll quickly get fat, without cake or corn;
She's clean in her jaws, and full in her chine,
She's heavy in flank, and wide in her loin.

She's broad in her ribs, and long in her rump,
A straight and flat back, with never a hump;
She's wide in her hips, and calm in her eyes;
She's fine in her shoulders, and thin in her thighs.

She's light in her neck, and small in her tail,
She's wide in her breast, and good at the pail;
She's fine in her bone, and silky of skin—
She's a grazier's without and a butcher's within."

To the breeders of cattle, the Herd Book, a volume commenced by Mr. Coates, and enlarged by new additions almost annually, is indispensable. As the Improved Short Horns are a breed created within the memory of man, and as their value mainly depends on the purity of their blood, a clear and unbroken pedigree is necessary for the security of the purchaser; and this may in all cases, where such blood exists, be traced in the Herd Book. Not only the pedigree complete of the English pure Short Horns may here be found, but that of the animals imported into this country, which have any title to the name, may be seen at once. Like the British Heraldry, its use is to detect impostors and expose pretenders, and for this purpose it is well adapted.

If the Improved Short Horns are to be extensively introduced into this country, it will be in the same way and for the same reason that all our other improvements are adopted. It will not be in consequence of any abstract or theoretical reasonings on their merits, but because they are found, from experience, to be more *profitable* than any other stock. Though what may be called an artificial breed, it is already one of the largest in the world; and it possesses one advantage which perhaps no other breed possesses in an equal degree, which is this, that

great numbers of skilful and experienced persons have, for a long series of years, not only adopted this breed in preference to any other, but have selected out of it the animals they deemed of superior quality, to breed from them alone; so that now it may be called a picked and chosen race, from which all beasts having any imperfection have been carefully excluded.

The man who introduces this valuable breed of cattle into any neighbourhood of farmers is a benefactor to the community, and should be regarded as such. Prejudice may decry, and ignorance may sneer, but we know the good sense of farmers will not always slumber; and in the approval of the intelligent, and the certainty of ultimate profit, he will find his reward.

Devonshire Cattle.—While it may be affirmed, with great truth, that the present beautiful and superior breed of Improved Short Horns is strictly artificial, and while some fears may be justly entertained lest the valuable qualities for which they are distinguished have not become so fully constitutional as to be beyond the possibility of relapse, we here bring to the notice of the farmer a breed of cattle scarcely inferior in any quality to the Short Horns, and of which no apprehensions can be entertained that the type of these distinguishing qualities is evanescent, and not durably incorporated in the constitution and race.

The north of Devon has long been celebrated for a beautiful breed of cattle, in activity of work and aptitude to fatten unrivalled. The place where they are found in the greatest perfection is in the vicinity of Portlock and Biddleford, along the Bristol Channel, in the county of Devon. From the earliest records the breed has here remained the same; or, if not quite as perfect in general as at the present moment, yet altered in no essential point until the last thirty years. No persevering or successful at-

tempts to improve the general character of British cattle were made until within some fifty or sixty years; and the Devonshire farmers were so well satisfied with their herds, that they were the last to dream that their beautiful red cattle could be improved; nor did they bestir themselves in earnest until the high prices and improved forms of the Collings' Short Horns convinced them that, in estimating their advantages, they were behind the age.

The most perfect specimens of the Devonshire cattle are found among the North Devons, and it is of these we shall speak. As the breed is of the middle horns, the horns should be neither too high nor too low, those of the *bull* tapering to the points, not very thick at the base, and of a yellow or waxen colour. The eye should be clear, bright, and prominent, showing much of the white, and should have a circle of a variable colour, but usually of a dark orange, around it. The forehead should be flat, indented, and small; for by the smallness of the forehead the purity of the blood is much estimated. The cheek should be small, the muzzle fine, and the nose of a clear yellow. The *ox* (see fig. 3) has a small head, singularly so relatively to the bulk of the animal, yet with a striking breadth of forehead. His neck is well adapted to the yoke or the collar; his horns are small and fine, and his forelegs wide apart, looking like pillars to support a great weight. Angular, bony projections are never found in a beast that carries much flesh and fat. A narrow-chested animal can never be useful either for working or grazing.

The skin of the Devon of the pure breed, notwithstanding his curly hair, is very mellow, fine, and elastic. Graziers know there is not a more important point than this. When the skin can be easily raised from the hips, it shows that there is room to set fat on below. The favourite colour of the

Devons is a blood red. The hair in some is curled, the curls running like ripples on water, and, when dark, giving a mahogany appearance. When the hair is smooth, it should be fine and glossy. Few

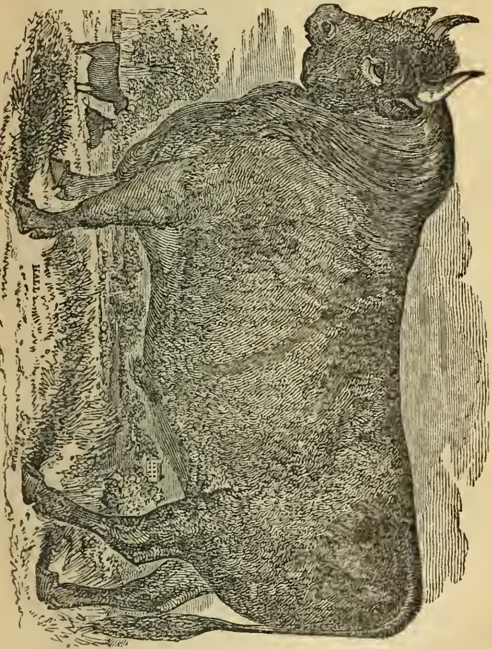


Fig. 3.

of good blood have any white upon them; and the pure Devon is as uniformly red as is the pure Short Horn red and white.

The comparative smallness of the Devon cow (see fig. 4) is one of the most remarkable traits of

their character. The bull is much smaller than the ox, and the cow proportionably smaller than either. This is considered somewhat of a disadvantage, as it is almost impossible to procure large and ser-

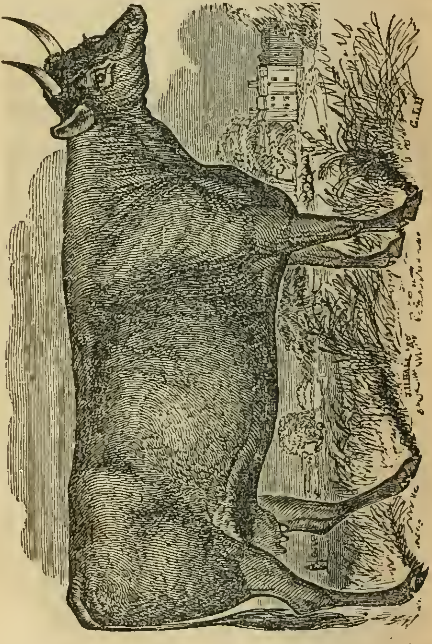


Fig. 4.

viceable oxen except from a *roomy* cow. Owing to her peculiar build, however, the Devon cow is more *roomy* than most other breeds of cattle of the same size, which in a great measure obviates the objection. The Devon cow is particularly distinguished for her full, round, clear eye, the gold-coloured cir-

cle about it, and the same colour prevailing on the inside of the ear. The muzzle is orange or yellow, while the rest of the face has nothing of black, or even of white about it.

The peculiar excellence of the Devonshire ox is a quickness of action in working, which few horses exceed, and which no other cattle can equal. They have also a degree of docility and goodness of temper, and stoutness and faithfulness for work, to which many teams of horses cannot pretend. Mr. Youatt, who is great authority on the subject of cattle, thus describes their usual mode of treatment and aptitude to fatten :

"The Devon steer is put to work at about two years old; they are worked until they are four, five, or six, are then grazed or kept on hay, and in ten or twelve months, without any farther trouble, are fit for market. If the grass is good, no corn, or cake, or turnips are required for the first winter; but of course, for the second winter, these must be added. The grazier likes this breed best at five years old; and they will usually, when taken from the plough, fetch as much money at this age as at six. Lord Somerville states that, after having been worked lightly on hill land for two years, at four years old they are brought into the heavy land of the vales, and used at hard work till six; and what deserves consideration is, an ox must be thus worked to attain his largest size. If he is kept idle until he is five or six, he will invariably be stinted in his growth. Mr. Youatt adds, that in their disposition to fatten, very few cattle can rival them. They do not, indeed, attain the great weight of some breeds, but in a given time they acquire more flesh, and with a less consumption of food, and their flesh is beautiful in its kind. It is of that mottled, marbled character so pleasing to the eye and to the taste."

As to the value of the Devon cow for the dairy,

different and somewhat conflicting opinions are entertained in England. Mr. Youatt says:

"For the dairy, the North Devon must be acknowledged to be inferior to several other breeds. The milk is good, and yields more than an average proportion of cream and butter; but it is deficient in quantity. There are those, however, and no mean judges, who deny this, and select the North Devons even for the dairy."

Perhaps one of the most valuable crosses that has yet been made is the one described by the celebrated breeder, Mr. Bolton, in a letter to the Farmer's Magazine:

"I have known many excellent beasts bred from Improved Short Horn bulls and long horn cows; indeed, I never knew one of these bulls put to any cow where the produce was not superior to the dam; but the cross which I advocate, and with which I am best acquainted, is that with the *Devon cow*. I have uniformly remarked, that a cross here was attended with a proportionate improvement in size, quantity of flesh, and aptitude to fatten. In every instance they have shown themselves superior milkers, and stand to the pail till within six or eight weeks of calving; and several instances have come under my knowledge where they have never been dry from the time they first calved. So highly are they prized as milkers, that a friend of mine, who hires out dairies, informs me, that the dairymen give him nearly £2 per cow per year more for the half and three fourths breed than they would for cows of any other breed."

Judging from the opinions expressed by cattle-breeders in England, by the agricultural periodicals of that country, and by the fact that, at the late Smithfield cattle show, open to the whole kingdom, the first prizes were taken by Devon cattle, we should conclude that, since the demise of some of the most celebrated Short Horn breeders, such as

Collings, Berry, and others, the Devons were treading close on the heels of the Short Horns in public estimation. The first premium at the late Smithfield fair was given to a pure Devon, the property of Mr. Coke, of Holkham ; and the second to a steer only 19 months old, of the improved Devon, or the Devon crossed with the Somersetshire breed. The ox weighed, when dead, 1122 pounds ; and the steer, when dead, weighed 1332 pounds. The steer was a most remarkable one, and was owned by Mr. Giblett.

The Devonshire breed of cattle has been more extensively introduced into the United States than any other foreign breed; and they form a large portion in different grades of the cattle of New-England and the Middle States. Some fine stock of this breed have been sent by Mr. Coke to Mr. Patterson of Baltimore, and two oxen of this importation, raised and fattened by the Messrs. Hurlbuts, of Winchester, Connecticut, weighed, when killed, as follows:

First Ox.		Second Ox.	
Carcass . .	1438	Carcass . .	1528
Hide . .	117	Hide . .	115
Tallow . .	175	Tallow . .	213
	1730 lbs.		1856 lbs.

Mr. Fisher, of New-York, addressed a letter to Mr. Coke, giving an account of these cattle, and received the following reply from that veteran agriculturist, which we insert, as showing his opinion of the Devons.

Holkham, April 21, 1831.

Sir,—I am this moment favoured with your kind letter and most flattering account of the Devon oxen. It is a pleasing reflection to me that I was the first person that introduced them into America, through my friend Mr. Patterson. I thought them at that time, and I am still more confirmed in my opinion now, that they are the most superior breed

of cattle in the island, if well selected. But I beg to be understood, when I speak of the Devonshire red cattle, it is in praise of the *North Devon cattle*, with yellow noses and indented foreheads, and yellow around their eyes, which mark their character beyond that of the South Devons, which have black noses, or intermixed with black. These I beg to be distinctly understood not to recommend as a superior breed of cattle. Be so kind as to express my acknowledgment to Mr. Hurlbut when you see him, and to assure him that I shall be at all times most happy to show him, or any of his American friends, should they come to England, every attention in my power in the agricultural line. THO. WM. COKE.

Mr. Colman, in his late Agricultural Report to the Massachusetts Legislature, says: "Essex county is not a grazing territory. Few cattle are raised in it. The stock generally found in it is what is called our *native stock*, which is a mixture of no certain origin, but in which the Devon race greatly preponderates." Some of this mixed breed in New-England have been excellent for the dairy, few of the best imported stock ranging higher. Mr. Colman notices some of these. One of these, the Oakes cow, owned in Danvers, Essex county, Massachusetts, gave, in 1814, 300 lbs. of butter; in 1815, over 400 lbs.; and in 1816, 484 lbs. At the same time, the family received one quart of milk per day for their own use; and she suckled three calves, four weeks each, in the course of those years. The Nourse cow, owned in Salem, Massachusetts, made 20 lbs. of butter in one week, and averaged 16 lbs. per week for three months in succession. A number of others are mentioned in the report that made from 12 to 18 lbs. weekly; and it may be generally remarked, that, wherever the Devon blood is found in the country, the nature is marked by colour, goodness of milking, and ease in fattening.

"In England the Devon cow is greatly esteemed for raising calves, as she gives the richest of milk, and the calves thrive rapidly. The Devon cow, too, is noted for producing the best *clouted cream*, which is so peculiar to the west of England. The milk is suffered to stand in a bell-metal vessel four-and-twenty hours; it is then placed over a small wood fire, so that it shall heat very gradually. After it has been over the fire about an hour and a half, and is approaching the state of *simmering*, the vessel is struck every now and then with the knuckle, and very carefully watched. As soon as it ceases to ring, or the first bubble appears, a slight agitation or simmering previous to boiling has commenced, and the secret of the preparation is, that the simmering shall not proceed to boiling. The milk is immediately removed from the fire, and set for 24 hours more. At the end of this time all the cream will have arisen, and be thick enough to cut with a knife. It is then carefully skimmed off. Such cream is a great luxury with coffee or with tarts; and strawberries and clouted cream need no praise."—*British Cattle.*

Much has been written on the subject of breeding cattle; but we are convinced the only correct theory can be given in a single line, and that is, to "*suit the breed to the soil and climate.*" To think of raising a breed of large, heavy cattle (for such must be great feeders) on a poor, cold, or elevated part of any country, would be an entire mistake. Experience has shown this to be the case in England; and such will unquestionably be the case here. All efforts to introduce the Short Horns of the improved kinds into the Highlands of Scotland have proved a total failure; the small, hardy cattle of the country, it is found, will thrive and grow fat where a Short Horn will starve; and the case is not widely different with the Devons, though this breed is more hard and, of course, rather more patient of change of climate

and pasture than the improved heavy Short Horns. Good keeping, which is a luxury to the parent, and may be used or not, as circumstances require, becomes absolutely necessary to the progeny, as without it there will be a falling off: a breed of animals cannot be taken from rich pastures and transplanted to a region where they must be busy to get a living, without speedy deterioration.

There are parts of our country to which, in our opinion, the improved breeds of imported cattle will not be found adapted. Because these cattle flourish, and even improve, in the rich valleys and prairies of the south and west of Kentucky, Ohio, Indiana, and Illinois, and can be advantageously grown in most parts of this state, we should not think it fair to infer that they would succeed on the sweet but *short* pastures of the hilly regions of this state and New-England, or that their large frames and thin skins are as well adapted to resist the inclemencies of our winters as a more compact and less delicate breed. In improving our stocks, climate and keeping should not be lost sight of; for, in the United States as elsewhere, there are sections where the native breeds will thrive and afford a profit, where the high-fed and artificial breeds would suffer, and, by their failure, bring undeserved odium on the cattle, and on those who have laboured for their introduction into the country.

Herefords.—Although the Herefords, in common with every other native breed of cattle to be found in England, have long had their representatives in the stock of this country, it is but a few years since that they have attracted much notice either at home or abroad. They had long been known as a large and valuable breed, capable of feeding quickly, and to a great weight; but the superior favour with which the beautiful Short Horns were received after their improvement by Collings, Berry, and others, had the effect to divert public attention from these, and, in-

deed, from almost every other breed of English cattle; and it must be admitted that no cattle could better deserve such distinction than the Short Horns. Within a few years a great improvement has been introduced among the Herefords; and, judging from the records of the Smithfield cattle-shows, and the reports of the various English Agricultural Societies, that breed, in some respects at least, is fast gaining in the public estimation; and, so far as the making of beef is concerned, it appears to be considered at least equal to the Short Horns. Mr. Youatt says,* "They fatten to a greater weight than the Devons, and run from fifty to seventy score. A cow belonging to the Duke of Bedford weighed more than seventy score, and an ox belonging to Mr. Webster exceeded one hundred and ten score. They are not much used now for husbandry, although their form adapts them for the heavier work, and they have all the honesty and docility of the Devon ox, with greater strength, if not his activity. The Herefordshire ox fattens speedily at a very early age; and it is therefore more advantageous to the farmer, and perhaps to the country, that he should go to market at three years old, than be kept longer to be employed as a beast for draught."

"They are far worse milkers than the Devons. This is so generally acknowledged, that, while there are many dairies of Devon cows in various parts of the country (none of which, however, are very profitable to their owners), a dairy of Hereford cows is rarely to be found. To compensate for this, they are even more kindly feeders than the Devons, and will live and grow fat where a Devon would hardly live. Their beef may be objected to by some as being occasionally a little too large in the bone, and the fore quarters rather coarse and heavy; but the meat of the best pieces is often very fine-grained

* British Cattle, p. 31.

and beautifully marbled. There are few cattle more prized in the market than the genuine Herefords."*

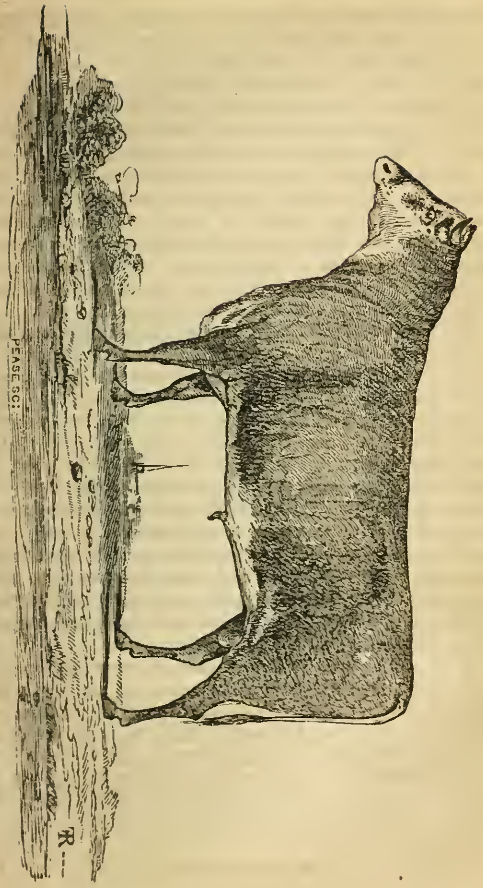
The Encyclopædia published by the London Society for the Diffusion of Knowledge, vol. xii., article Herefordshire, corroborates the above statements fully, particularly that in regard to their milking qualities, asserting that none are kept for their milk alone, but that the cows are used exclusively for the purposes of breeding. It must be remembered, however, that milking qualities are as easily conferred by the skilful breeder as other desirable qualities; and if they do not at present exist in the Herefords, they can be introduced into the breed, as was done by Mr. Berry into the Short Horn. At present, their unfitness for the dairy, it must be acknowledged, constitutes a formidable objection.

Specimens of the Herefords were imported into this country several years since by the Hon. Mr. Rives, of Virginia, and more lately by the Hon. H. Clay, of Kentucky; but they do not seem to have been received with the favour that has been accorded to the Short Horns or the Devons. (See Fig. 5.†) More lately, importations of this fine stock have been made by Messrs. Gotham and Corning of this state; and a fair experiment will now be made of their comparative merits in feeding, milking, and draught with our favourite imported breeds, the Durhams and Devons; and their ability to endure our climate, and to thrive on our upland medium pastures, will be also fully tested.

Long Horns.—For a good many years past, the importations of cattle from abroad have been confined mostly to two kinds, the Devon or middle horn, and the Durham or short horn varieties; and the general excellence of these cattle is such as to justify the preference shown them by the breeder. In

* British Cattle, p. 32.

† The opposite figure is a portrait of a Hereford bull two years old, imported by Mr. Bement, of Albany, in 1839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examining the cattle in different parts of our country, however, we discover traces of other and earlier importations; and now and then an animal whose general configuration, and particularly his horns, show that he has been derived from the Long Horns, a breed of cattle once very celebrated, is met with. This breed of cattle has probably exercised as much influence in modelling the type of what are called our native breeds of cattle as any other, and may therefore be worthy of notice; though to the cattle-breeder their principal interest is owing to changes they have experienced in the hands of skilful dealers in England, the excellence to which they arrived, and their sudden decline.

What are termed the native Irish cattle, or the Irish Long Horns, may be considered as furnishing the most striking peculiarities of this breed; though in the district of Craven and part of Lancashire, this breed of cattle has been noticed from the very earliest period. In the early breeds, "the horn frequently projected nearly horizontally on either side; but, as the cattle improved, the horn assumed other directions; it hung down so that the animal could scarcely graze, or it curved so as to threaten to meet before the muzzle, and so also prevent the beast from grazing; or immediately under the jaw, so as to lock the lower jaw; or the points, presenting themselves against the bones of the nose and face, threatened to perforate them."*

It is somewhat singular, that in every great improvement of any particular breed of animals, the impulse is first given by, and the effect, in the remotest degree, can be traced back to, a single individual. For half a century there has not been a horse of note in England whose descent could not be traced more or less directly from the Godolphin Arabian. We have already spoken of the influence

* British Cattle.

exerted by the bull Hubback in originating the improved Short Horns, and the bull BLOXEDGE, in the hands of Mr. Webster, was not less famous than the former. This gentleman, Mr. Havel, Mr. Welby, and others, had done much in improving this stock, but their exertions were all outdone by the success of Mr. Bakewell, whose labours in the improvement of the English breeds of cattle and sheep have placed his name in the front rank of British agriculturists.

His breeds of these animals were well known, both in England and in this country, by the names of the Dishley or Leicestershire cattle or sheep, from his residence at Dishley, in Leicestershire. It is to be regretted that we have no full and particular account of the principles that guided Mr. Bakewell in his efforts, since it would seem that, though remarkably successful himself, his mode of breeding did not render the excellences of his breed of cattle constitutional or permanent, as he had scarcely left the stage before the peculiarities of the original type began to prevail, and the improved Bakewell stock are now but little known. From the observations of Mr. Marshall, it seems that his greatest aim was beauty of form, under the somewhat mistaken idea that beauty of form and utility are inseparable; the next was a proper proportion of the parts, so as to reduce the offal to the smallest degree; and another was to render the texture of the muscular parts fine and of good quality for beef; while the propensity to fatten was not overlooked, as, after all, the great value of any breed of cattle is its adaptation to the grazier and the butcher.

As Mr. Bakewell was nearly the pioneer in the improvement of British stock, he deserves great praise for his judgment in the proper selection of points to be aimed at in breeding; and, as an acute observer of animals, he had sometimes found these desired qualities centred in the same individual, and

was therefore certain they were compatible with each other. He was more unfortunate in selecting the Long Horns as his stock to breed from, though in his hands they reached a perfection only equalled by the Short Horns of Culley and Berry of the present time. In breeding, Mr. Bakewell discarded the common practice of selecting females of the common stock and crossing them with males of another breed: his method of improvement was to select animals possessing the desired qualities from the same breed, and increase his stock from them. Two heifers from the celebrated Long Horn stock of Mr. Webster, and a Long Horn bull, selected with great care in Westmoreland, constituted his breeding stock in the commencement. Though confining himself to these animals and their progeny most strictly, he was enabled, as his stock increased, to avoid the injurious consequences of breeding "in and in," by selecting animals the most distantly related, and in this way he established the good points or removed the faulty ones with a rapidity and skill hitherto unrivalled. It has been objected that Mr. Bakewell carried his attention to the propensity to fatten so far, that the Dishley or Leicester breed of pure blood "produce too small a quantity of eatable meat, and that, too, necessarily of an inferior flavour and quality. They are in general found defective in weight in proportion to their bulk; their carcasses produce little else but fat, a very considerable part of which must be sold for candles instead of food."*

Mr. Bakewell was followed by Mr. Fowler and Mr. Princeps; and so high was the reputation and value of the New Leicesters raised by their attention and skill, that the public sales of their cattle rivalled in prices those of the best Short Horns of the present time, and they were sought after with the same avidity. Those who wish to understand the

* Illustrations of Natural History.

particular points in which the New Leicesters differed from the common Long Horns, are referred to the fourth volume of the Genesee Farmer or the volume on British Cattle, where these peculiarities are described. But what has become of Bakewell's Improved Long Horn breed is a question which may well be asked, when it is known that it has entirely disappeared from the vicinity in which it originated, and the farm from which it received its name. "The truth of the matter is, that no sooner had the master spirits of the day disappeared, than the character of this breed began imperceptibly to change. The cattle had acquired a delicacy of constitution inconsistent with common management and keep; and they began slowly, but undeniably, to deteriorate. Many of them had been bred to that degree of refinement, that the propagation of the species was not always certain."*

Let the attention of cattle-breeders be called to the fact stated in the last sentence; for all experience among animals (and, we may add, the doctrine receives abundant confirmation from a race still higher in the scale of being) shows that breeding "in and in" has a direct tendency to decrease the certainty of the propagation of the species; and the evil results noticed by Marshall, though counteracted by Bakewell's care and skill, were apparent in the cattle bred by his successors.

But, though the particular breed of cattle known as the Improved Long Horns has almost ceased to exist as such, the beneficial effect of Mr. Bakewell's efforts have not been lost, but by crosses with other breeds, and in particular with the Short Horns, have been widely diffused. In the most highly favoured districts, the Short Horn has superseded both the Long and the Middle Horns; but there are in all countries extensive territories where a more hardy

* British Cattle.

and less grossly feeding race of cattle will be required, and which, in such a mixture of the races, will be preferred to either the Improved Short or Long Horns. Some efforts have been made to restore to the Long Horns the celebrity they once enjoyed; but experiments instituted to test their comparative value with either the Devons or Durhams have usually terminated unfavourably, and have added to their disrepute. Mr. Gibson, of Quernmoor Park, in the native country of the Long Horns, tried an equal number of the Short and Long Horns for twelve months; and, on summing up the profit and loss at the expiration of the time, the Short Horns had given considerably more milk, the butter account was also in their favour, and they had improved considerably more in condition. The experiments of others have had a similar result. Mr. Harrison remarks, "that the average weight of the Long Horns, when fattened, is eight score per quarter; but their value is not so great either for grazing or milking by nearly or quite £2 per head."

The Wiltshire cow was a species of Long Horn, and was considered as one of the best breeds in England for the dairy, which enabled them to resist the attempt made some years since to substitute the Devon for them, as being more desirable in many respects; but the introduction of the Short Horn has caused the old breed mostly to disappear. The cross which has resulted from the Wiltshire and the Short Horn is highly valued in the dairy, both for the quantity and quality of the milk. There is a constant tendency, however, to degenerate, and the cross must be carefully watched. The mode of prevention which has been found effectual is a frequent recurrence to a Short Horn bull, and frequently changing the bull. "The average quantity of cheese made from the cows of this district is greater than from any other breed of cows in Britain; sometimes as much as 450 or 500 lbs. to a cow, seldom lower than

300 lbs."* Summers moderately wet, with closely-fed yet fresh feed, are found better for the dairymen than when decidedly wet, with more abundant but coarser feed. The celebrated Stilton cheese is made from a cross of the Leicester and Durham, is produced from the cream, and, when of first-rate quality, it sells from 30 to 50 cents per pound. Hundreds of tons of it are sent from Lancashire and Leicestershire to London every year. Though the Short Horn, or some cross of the kind, is generally found in the great dairies for the supply of the cities, yet a very large proportion of the butter and cheese made in Great Britain comes from the districts where the Long Horns have the ascendancy.

A series of experiments in fattening cattle have been in progress for several years past at Woburn, the seat of the Duke of Bedford, in which cattle of different breeds have been fed alike, and the cost of the cattle, the expense of feeding, and the ultimate profit and loss of the different lots and methods have been carefully registered. The Durhams, or Short Horns of the improved kinds, from their early maturity or ripeness, and the facility with which they take on fat, have hitherto stood highest on the list, although, in some instances, they have been closely pushed by the improved Devons and the Hertfordshire cattle. The polled cattle have been the lowest on the scale, and are now excluded from the pastures of the Woburn estate. The profits in feeding have been greatest where turnips have been the base of feeding, in connexion with hay; and the greatest loss was sustained where linseed-cake was used as the principal food. We copy the following, as exhibiting the nature of the experiments and the mode of conducting them :

Six oxen, grazed in the same pasture, were put up for stall-feeding on the 6th of January and fed till the 14th of April : they were divided into pairs.

* Marshall's Midland Counties.

The first pair, or Nos. 1 and 2, consumed of hay,	
18 cwt., 1 qr., value	$13 14
Flour, 1 qr., 14 lbs.	8 64
Mangold-wurzel, 196 bushels	35 28
Expense of feeding	$57 06
Gain, 3 cwt , 1 qr., 7 lbs., value	59 35
Gained by feeding	2 29
Nos. 3 and 4 consumed of hay,	
20 cwt., 2 qrs., value	$15 24
Bean flour	8 64
Swedes turnips, 196 bushels	35 28
Expense of feeding	$59 16
Gain, 3 cwt., 2 qrs., 21 lbs.	66 08
Gained by feeding	6 92
Nos. 5 and 6 consumed of hay,	
23 cwt., value	$15 30
Bean flour	8 64
Potatoes, 78 bushels	20 28
	$44 22
Gain, 2 cwt., 3 qrs., 7 lbs.	48 00
Gained by feeding	3 78

The extraordinary success of Mr. Bakewell in bringing this breed of cattle to such a state of excellence in so short a period, may serve as a stimulus to the improvement of other breeds; though the rapid declension would seem to show that the principles on which he conducted his improvements contained some radical defect, which is probably to be found in his system of continual breeding "in and in," without the intervention of so much as a single cross. As all the cattle in this country have been derived from foreign sources, and principally from England, the mixture and crosses are so innumerable, that the attempt to trace most of our cattle to their proper origin would be a hopeless task. The quality of the whole has, however, we think, materially improved within a few years, owing principally to the exertions made to call the attention of breeders to the subject, and the numerous im-

proved cattle, both Devon and Durham, that have been introduced into the country. No small part of a farmer's wealth is derived from his stock; and he should always take care that they are such as to ensure the greatest returns, whether intended for beef or the dairy.

Ayrshire and Galloways.—Though almost every breed of cattle in England and other parts of Eu-

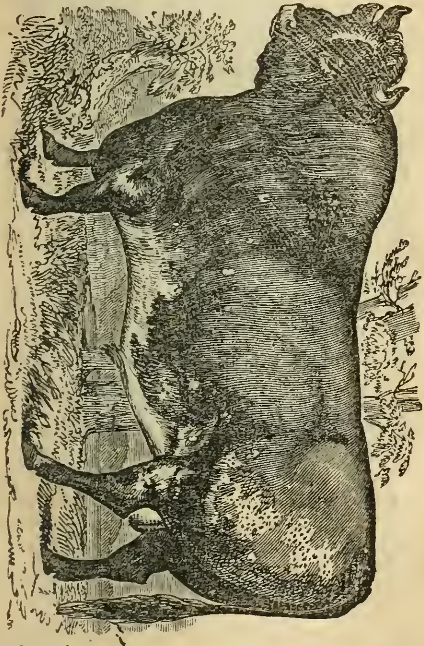
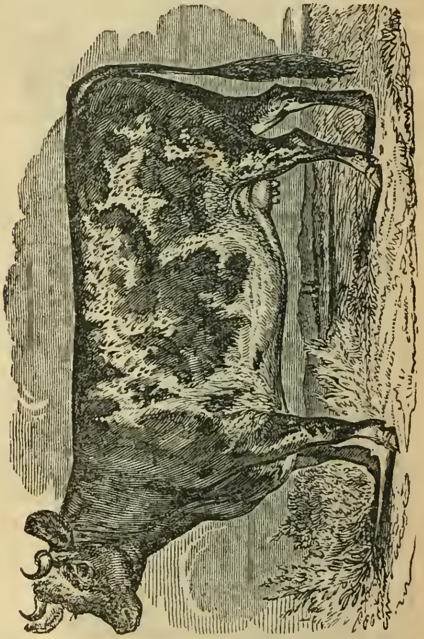


Fig. 6.

rope has its representatives in our common stock of cattle, or has at least contributed to the motley

character which they possess, there are only two others that have made an impression deep enough to deserve a distinct notice, and those are the Ayrshire, and Angus or Galloway breeds, both from Scotland. (For a representation of the Ayrshire bull, see fig. 6.) The following is the best description of the Ayrshire cow (see fig. 7) that we have

Fig. 7



seen (and it is as cows this breed is principally celebrated), taken from the Edinburgh Quarterly Journal of Agriculture:

"The external characters of the best of the Ayrshire cattle are, a straight and nearly level back, the top of the shoulder being a little below the level line, and there is an evident tendency to depression over the loins. The ribs are pretty round, and the body deep; but there is a deficiency in the filling up of the buttocks. Viewed from before and behind, the carcass is very narrow, particularly before. Viewed from above, the shoulder is much narrower than the hooks, which gives the body a considerable wedge shape, and the top of the shoulders a sharpness. The legs are short, and the body looks long for its height. The muzzle is fine, the face broad, but rather short, the eye complacent, the expression of face gentle, and the horn short and turned upward, though not gayly. The colours are red and white, like the Short Horns, though not so rich, and mixed in some places with black; but they are arranged in irregular blotches and patches, which are seldom round, and never grizzled. The thinness of the skin and the fair handling indicate a disposition to give milk, and a tolerable feeder. The breed, in its uses, is almost, if not altogether, confined to the dairy."

This description is sufficient to show the points of resemblance, or, rather, those in which they differ from the Short Horns, with which, from their *colours*, they are more apt to be confounded by the inexperienced than any other breed. The least attention, however, to their make will show at once the wide difference between them, and the great superiority of the Short Horns as feeders, and, we believe, as milkers also. It will not be disputed that the Short Horns consume more food than the Ayrshires, or any of the smaller lighter breeds; "but then they give more milk, take up less room, and give less trouble in proportion to the quantity of milk they give." As a proof that such is the opinion entertained abroad, we may state, on the

best authority, that the large London dairies, in which the Ayrshire cows formerly occupied the highest place on account of their milking qualities, are now supplied almost wholly from the Short Horn districts. The Ayrshire cow is small, but she is more hardy than the Short Horn; and the opinion of an eminent breeder at the Highland Cattle-show at Ayr in 1835 will probably be found nearly correct, "that the Ayrshire cow was better fitted for the cottage or the small farmer than the Short Horn, but that the latter would certainly be found the most profitable for the large farmer." The milking properties of the Ayrshires have probably been exaggerated, as some with whom they were favourites have stated the yield at 1000 gallons a year from a cow. There are few cows of any breed that would exceed, or even reach this mark. The quantity a cow will give in the height of the season is no criterion of the quantity she will yield through the year; and it is not uncommonly the case, that those cows which yield their milk the most liberally during the summer months, "go dry," as the phrase is, for the longest period.

The writer in the Quarterly Journal from whose communication the above extract on the qualities of the Ayrshire cow is taken, gives the following extraordinary instance of milking properties in a cow, and the descent of those properties to her calf.

"The cow was a cross between a Short Horn bull and a polled cow, and belonged to the steward of a farm in Berwickshire. She yielded ten gallons a day during the height of the season, and she had to be milked five times a day to keep her easy She would regularly come at the appointed time to the gate of the field to be eased of her burden. * * A heifer from this cow, before it ever saw a bull, for none was kept on the farm on which it was bred, dropped an udder and gave milk when it was only two years old. The owners thought some disease

had affected the udder when they saw it enlarging; but, in endeavouring to rub and strip the teats with a view to relieve them, pure milk came, and continued to come all summer, as abundantly as if the heifer had borne a calf."

It is too clearly the case, that the breeders or partisans of different breeds of cattle are prone to overlook the defects of their own, and to underrate the good points of others. Thus Mr. Aiton, in his Dairy Husbandry, gives the preference altogether to the Ayrshire cow, while Mr. Berry and other writers consider them as decidedly inferior to the Short Horns or the Devons. The truth probably lies between the extremes; and while, for the combined properties of milking and feeding, the Short Horn, in all rich and fertile districts, must bear away the palm, in those less favoured by nature, or where pastures are less luxuriant and abundant, and quantity and quality of milk (without particular reference to feeding properties) are aimed at, the hardy nature of the Ayrshire cow, and the acknowledged richness of her milk, render her, we doubt not, a great acquisition. The Ayrshire breed itself is probably a cross, as it is comparatively but a few years since it came into notice in Scotland, where it was first known as the Dunlop cow, from the gentleman who first reared them as a distinct breed. This fact, while it accounts (there being no permanent type to give stability to the race) for the facility with which this breed of cattle is mixed with other varieties, gives ground also to the supposition that in some of the crosses to which cattle are subjected by breeders, the peculiar quality of the Ayrshires may be united with and rendered permanent in some of the more fixed and stable breeds.

The *Galloways* are a Scottish breed of cattle, and are named from the district comprehending the counties of Wighton and Kircudbright. This breed of cattle is now usually polled or hornless; but this

may be considered the effect mainly of confining the breeding to those without this appendage, as some years ago many of them were horned; and it is now not uncommon to find them with a small horn attached only to the skin. The body of the Galloway is deep; the head rather large; the eye shows little white, and indicates sulkiness; the skin handles finely, and is well protected with fine hair; the beef, when well fed, is of the best quality, and commands the highest prices in the Edinburgh and London markets; and the flesh is placed mostly on the back and hind quarters, the most valuable parts of a fat ox.

The Galloways are far more uniform in their excellence than the other breeds of hardy or Scotch cattle, and, where seen in this country, there is a greater resemblance than in most other kinds, indicating that the type of the breed is more permanent than in some others. The Galloways do not arrive at early maturity, seldom being what is called ripe till four years old.

The polled cattle are not usually good milkers; hence but little attention is paid to them for the dairy. The best of the heifers are kept for breeding cows, while the ordinary and inferior ones are spayed, and sent with stots or steers to the pastures of Norfolk and Suffolk, to be fed for the Smithfield market. These spayed heifers never attain the size of the steers; but they come earlier to maturity, and produce beef of a superior quality. The operation of spaying was formerly delayed till the heifer was a year old, but it is now usually performed a few months after their being calved.

The hornless cattle are so sparsely distributed in this country, and it not being probable that the breed will be greatly increased, since they are celebrated neither for the quantity nor quality of their milk (considerations which justly have great weight with owners of cattle here), it would be of little use to enter into any farther description of them. At pres-

ent, in the United States, the milk is quite as much an object in raising cattle as the quality of feeding; and the breeds that most efficiently unite these qualities will, of course, be received with most favour by the agricultural community.

In this view of the matter, it seems to us that the Short Horns and the Devons are the breeds to which we must look for the improvement of our stock; and that the introduction of blood from either of these into our common breeds of cattle would be a decided benefit, will not be denied by any one who has witnessed the effects of such crossings. That pure-blooded Devons or Short Horns will soon be found on every farm, we do not expect; but the annual importations of these animals, added to those produced by our public-spirited men who have engaged in the rearing of pure-blooded cattle, will, by distributing valuable animals far and wide, bring them to the notice of farmers, and thus gradually make an impression on the great mass. In whatever neighbourhood a Short Horn or a Devon bull has been owned, the effect is visible on the stock; and the fine, square form of the one, and rich colour of the other, may be clearly traced. We know some towns in which, from the introduction of Devon bulls of good blood six or eight years since, nearly all the cattle of the farmers around, by their mahogany red, their fine, white horns, and their yellow, soft skin, show the influence of such blood. And the same may be said of places where the Improved Durham has been introduced. We hail, therefore, with satisfaction every accession to the stock of good animals in our country; we like the spirit of improvement it indicates; and consider it a proof that our farmers, in everything that can contribute to their wealth, comfort, and respectability, are destined not to remain long behind those of any other country.

CHAPTER X.

THE POTATO.

Varieties.—Soil.—Cultivation.—Modes of Planting.—Early Potatoes.—Experiments in Planting.—Great Crops.—Diseases.—New Kinds.—Nutritive Properties.

If the Old World has given to the New the invaluable grain plants, wheat, barley, and oats, the New has abundantly repaid the debt with their stoad, maize or Indian corn, and the *Solanum tuberosum*, or common potato. The potato is indeed mentioned by writers previous to the discovery of America; but the root alluded to is the sweet potato, a native of the East Indies, and early cultivated in the warmer parts of Europe. Thus, when Shakspeare makes that type of good living, the jolly Falstaff, exclaim, "Now let the sky rain potatoes," we are not to infer that he had ever heard of "Irish whites," or that his aspirations extended to modern "pink-eyes." The potato was early introduced from South America into Spain, and was brought from Virginia by Sir Walter Raleigh, and planted in Ireland, where it soon became a general favourite, and obtained the distinction which it still maintains. In England, and Europe generally, it spread more gradually; and it is but a few years since its merits as an article of food were firmly established in France. The potato, however, seems destined to make the circuit of the globe; and, as an article of food for man, it stands at the head of all the roots, and not much below the highest of all the cerealia, wheat. Perhaps there is no plant cultivated in the temperate latitudes, from which so much food per acre, adapted to the subsistence of man, can be procured, as from the potato.

It is one of those plants, the introduction of which into a favourable climate will enable a country to double its population without materially trenching on their other means of subsistence.

The maize and the potato are striking examples of the effects produced on plants by culture and acclimization. Both are natives of the tropics, and both are now grown successfully in high northern latitudes; while in their native warm climates the product of both is of an inferior quality compared with that within a few degrees of the utmost northern limit of their growth; examples of which may be seen in the corn of the Southern States and of the West Indies, and in the potatoes of the South American plains. Last year a quantity of the original root was brought from Venezuela to London, and carefully planted. The product was small and of inferior quality, more resembling ground-nuts than potatoes, or rather approaching the first year's growth of roots produced from the seeds of the potato apple.

In the cultivation of the potato, the root or tuber is alone used for seed, as the plants from these are far more vigorous and productive than those from the true seed, or such as are grown from the blossoms. For producing new varieties, however, recourse is had to the apples, the seed of which, planted in beds, will produce roots, and from these new varieties may be obtained at pleasure. It is in this way that most of the best modern sorts have been produced. To attempt to enumerate all the varieties known would be a hopeless, not to say useless task, as more than 150 are enumerated in the Transactions of the Highland Society, many of which are only distinguished by such nice shades of difference as to be wholly overlooked by the common observer. In this country the number of varieties is scarcely less, though many of the kinds designated belong to the same variety. Colours may be considered as

forming the most distinguishing and permanent characteristic, though in the roots grown from seeds, these are found blending in every shape and form. Most of our kinds have been introduced from England and Ireland, and hence partake of the qualities of those grown in those countries, though perhaps with a different name. In the British Husbandry the following six varieties are given as of superior quality; and the quantities grown per acre, as recorded by the Highland Society, is as follows:

Irish kidney pink-eyed . .	363 bushels.
Dryden's white kidney . .	302 "
American early white . .	242 "
Ash-leaf round white . . .	363 "
London particular . . .	363 "
Prince of Wales . . .	484 "

Some potatoes are early, and some late; some mealy, and some waxy; some pleasant to the taste, and some strong and disagreeable; some very productive, and others not so. It is evident, therefore, that the kinds should be kept as distinct as possible; not because the roots will intermix, but because the several qualities are ripe at different periods, and are of very different value.

"The potato will grow upon almost any kind of soil, provided it is not *too wet and too clayey;* but light, dry, friable loams, or sand of tolerable consistence, are the most appropriate."—*Brit. Husb.* Swamps containing large quantites of vegetable matter, when well drained and reclaimed, are good for potatoes, and produce large crops. New lands that abound in "muck" are favourable to their growth; but on poor land of any kind, unless heavily manured, the potato will not succeed. As to the effect of potatoes upon the soil and on the succeeding crops, recorded experiments are exceedingly contradictory. Considering the great quantity of nutritive matter the potato draws from the soil, it cannot, reasoning analogically, be viewed in any other light than as

a serious drain upon the vegetative powers of the land. In England and Ireland, however, large quantities of the finest wheat are produced after potatoes; but as this crop is usually heavily manured, and as its culture requires a thorough moving of the soil in planting, hoeing, and gathering, this will account for the success of the wheat, in defiance of the drain upon the soil by the potato. In this country wheat rarely follows the potato unless as a spring crop, in which case it usually succeeds well.

With us potatoes are almost invariably planted in hills; in England and Ireland, in drills or by dibbling. According to the British Husbandry, "The market gardeners and farmers of Essex, from which the London market is principally supplied, dibble in their sets; and a plan followed by men engaged in such large undertakings is entitled to every degree of attention."

The ground is laid out in drills at the average distance of two feet, the surface being flat or ridged, according to the nature of the soil. In Yorkshire, the ground is ploughed into one-bout ridges, and the sets or potatoes used for seed are dropped by women and children in the furrows. The manure is put in at the same time and covered by the plough, dividing the ridge, and making a new one over the potatoes. Potatoes should be kept clean until the tops have a considerable size, when they overcome all weeds, and require no farther attention till the time of gathering. Manuring in hills is also practised in this country, and in most instances with success; but from some experiments made by the British Board of Agriculture, it appears that sets placed *over* the dung produced at the rate of five to four beyond those placed *under* it: thus, with an equal quantity of sets and manure, those placed above the manure gave 105 lbs. four ounces, those beneath, 84 lbs. three ounces.

Few individuals in this country will be inclined,

perpaps, to undertake the production of new varieties from the seed; but, for the benefit of such as may be disposed to do it, we condense from the account of Knight the following description of the process. Select a few large ripe apples from a healthy plant, and preserve them in dry sand during the winter. The seeds from these apples are to be picked out, and sown in rich garden mould as early as the springing plants will be safe from the frost. In the fall these seedlings will produce tubers, the largest and most promising of which are to be gathered for planting in the following spring. When the shoots rise a few inches above the ground, they should be covered with mould, and afterward managed in the same manner as if grown from the old potato. The celebrated new variety, called the "Downton yam potato," white, mealy, and well-flavoured, and a good bearer, was in this way produced by Mr. Knight.

Conflicting opinions have been maintained as to the propriety of planting sets or cuttings, or whole tubers or roots, and the numerous experiments made in this country and in England seem to have left ample room in their results for this difference of opinion. One of the most carefully conducted, and, therefore, most satisfactory of these recorded experiments, was that made by the London Horticultural Society with five different varieties; one half of the ground used being planted with whole tubers, and the other with sets containing but one eye each, placed at equal distances (18 inches apart), with the following results.

Weight when taken up:

Species.	Whole tubers.			Single eyes.		
	Tons.	cwt.	lbs.	Tons.	cwt.	lbs.
Early Manley	17	10	4	18	19	82
Shaws	20	15	26	20	0	4
Red-nosed Kidney	18	7	71	17	12	49
Pink-eyed Scotch	22	15	83	20	2	7
Champion	23	14	0	24	9	18

"The whole tubers appeared above ground, in each instance, three or four days earlier than the sets, and the haulm became somewhat longer; but the experiment shows that, although the total amount thus estimated to be obtained is,

	Tons.	cwt.	lbs.
From whole tubers	113	2	17
From single eyes	111	3	54

thus giving an apparent difference in five acres of about two tons, yet it was hardly more than the difference between the weight of the tubers and the sets originally planted."

According to Dr. Anderson and others, it requires in the drill method, if planted with sets, 20 bushels of seed to the acre; if with whole tubers, from 35 to 37 bushels. When planted in hills, not more than one half of this quantity is usually put in, whether sets or whole tubers are used.

Early potatoes have always been very desirable; and, when the root is cultivated for market, the profit on the early varieties far exceeds that on those which come to maturity at a later period. In this country the *black mole-nosed*, the *nutmeg*, and the *kidney buff* are, we believe, the most esteemed early kinds. But it should be remembered that a little attention to planting will make a difference of from ten to fifteen days in coming to maturity in almost any of the ordinary kinds. According to Loudon, "In the western part of Lancashire, the early potato is cultivated in warm situations, and brought to market at the end of May and during June. The cultivators, aware that the buds from the root and top end of the tuber germinate at different periods, assort their sets. Each potato is cut into five parts; the first or top set, that which contains the greatest number of shoots, is found to come to maturity a fortnight earlier than the cutting at the root end, and is always selected to produce the crop of early potatoes. The others ripen successively; the root

set or cutting being the last, and producing a less quantity than the other sets."

The same result has been noticed in this country, and the fact should be more generally known. A correspondent of the Farmer and Gardener says:

"I caused a large square of ground to be prepared in my garden, and laid out in four long beds, all well manured. In one of these beds I planted the top or crown of the potatoes (Mercer variety), in the next the sides, and in the last two, the crowns and sides promiscuously. The crowns are all up, and look very flourishing, being eight inches high. On examining the bed in which the sides were planted, I find them just sprouting, being about one inch from the bulb, but the surface of the ground having no appearance of vegetation whatever. The other two beds have come up as they were planted, promiscuously, presenting a very irregular appearance, some of the shoots being eight inches high, while others have not yet made their way through the earth."

Another interesting experiment, to determine not only the comparative value of whole roots and cuttings for planting, but the most suitable distance for the sets, was conducted by Dr. Lindley for the London Horticultural Society, with the following results:

Dist. between the rows. ft. in.	Sets.	Weight of seed required per acre. lbs.	Product per acre, deduct. weight planted. tons. cwt. lbs.
2 6	Whole tubers	6,497	18 8 4
	Single eyes	1,470	15 19 82
2 0	Whole tubers	7,426	21 4 82
	Single eyes	1,794	24 0 87
1 6	Whole tubers	11,764	21 4 72
	Single eyes	2,055	22 16 102
0 6	Whole tubers	32,065	16 17 21
	Single eyes	5,008	16 17 110

This experiment would seem to go far in determining two things, viz., that sets are more valuable, in comparison, than tubers, and that the most proper distance of planting must be determined by the height to which the stems of the variety planted usually grow, which in this case was about two feet.

The potato-crop, like all others subjected to field-culture, varies much in productiveness. In England, the average, under their common system of farming, is stated to be from 200 to 250 bushels per acre, or from six to eight tons. Thirty-two bushels of 70 lbs. each are calculated as a ton; but heaped measure will sometimes weigh more. In the United States, the average crop cannot be estimated higher than from 175 to 200 bushels to the acre; a deficiency owing to our scanty manuring, late planting, and imperfect cultivation. Perhaps a majority of our farmers do not finish the field-planting of potatoes until in the month of June; while in England and Ireland, March and April are the months of planting. The consequence is, that many of our potatoes do not get ripe; the tops, while in full vigour, are killed by the frost, and watery, imperfect, and indigestible roots are the result. That this country is admirably adapted to the growth and perfection of the potato, is evident from the heavy crops that have been produced, where proper care has been given to the cultivation. The heaviest crops on record are those grown by Gen. Barnum, of Vermont (see Genesee Farmer, vol. v., p. 19 and 141), which, on a careful estimate, and an average of five pieces, was 1800 bushels to an acre; and he gives it as his opinion, that in good soils, and with his mode of culture, from 800 to 1000 bushels per acre may be safely calculated upon. From 500 to 700 bushels per acre have been not unfrequently grown by others, as the records of our agricultural societies testify. Gen. Barnum's mode, after a thorough preparation of his land, is to plant in drills at the distance of 22 inches, and the sets in the drills 10 inches apart. The earth is hilled around the plants but once during the season, as there is much danger of disturbing the young tubers, or causing the formation of late new ones. But the great secret of his crops consists in bringing rich fresh earth, the scrapings of ditches or streets,

earth from barnyards or mould from swamps, and putting this for a top-dressing on the plants. This is done with a horse and cart, the horse travelling between the rows.

There is an opinion very prevalent among farmers (an erroneous one, we think), that where tubers or sets of different varieties are planted indiscriminately, or even near each other in the same field, the product will be of a mixed character, a single root combining the colours and qualities of the varieties planted; or, in other words, the new root will be a genuine hybrid. Such an effect is physiologically impossible. The roots of a plant are not the *seeds*; and it is these latter alone that can feel the influence of the fecundating pollen distributed by the flowers. Apple-blossoms, impregnated as they usually are by the pollen from other blossoms, produce fruit proper to the tree; yet the seed, if sown, will rarely produce trees resembling the parent; and no man would suppose that, because these apple-*seed* produced plants dissimilar to the parent tree, a sprout that should spring up from a root, as is sometimes the case, should be so likewise. The fact is, the propagation of the potato by the tubers and by the seed is an operation as distinct as the growth of the mulberry from cuttings and from seed. The root or the cutting will invariably produce the same variety, but the seed will not with certainty, unless the possibility of fecundation from other varieties is carefully guarded against.

There is also another point on which agriculturists are somewhat at variance; and that is, the propriety of cutting the stem of the potato before the root arrives at maturity. Gen. Barnum maintains "that an early frost, which nips the tops and destroys the vine, does not prevent the growth of the potato, and that such a notion ought to be exploded. On the contrary, if at this time it has not attained its full growth and weight, it grows more rapidly, the nour-

ishment required for sustaining the top being transferred to the roots ;" and he thinks that, on this principle, the cutting of the haulm early would be beneficial to the crop of potatoes.

We think there must be a fallacy in this mode of reasoning. Numberless experiments, and the united opinion of all writers on vegetable physiology, go to establish the fact, that the farinaceous or nutritive matter of plants is prepared in the stem and leaves, and deposited by them in the receptacles which nature has provided, as, for instance, in the kernel of wheat and the tuber of the potato. If this be the case, the stem of the potato must be essential to its perfection; and this view of the matter is established by the fact, that, when the root becomes ripe, the stem, being no longer wanted for the purpose of preparing nutriment, perishes of itself. But, in addition to the reasons here assigned, experiments have been instituted for the special purpose of putting the question at rest. In the British Husbandry it is stated that "cutting off the haulm or straw at different stages of its growth has been found to occasion a deficiency in the crop, in exact proportion to the earliness of the cutting. It was also prejudicial to the quality of the root; for the tubers continue to improve till the stems begin to decay, but become stationary the moment they are deprived of it, and, consequently, do not arrive to perfection either in size or nutritive properties. Thus, by an experiment tried by Dr. Anderson (and reported in the fourth volume of the Bath Agricultural Society papers) upon plants upon which the stems were cut from the 2d of August to the 5th of September, the loss in produce from the August cutting was very great; and that from the September cutting was calculated at not less than 93 bushels an acre. When the cutting is deferred until about the time the stems show symptoms of decay, it will probably do no harm to the roots, and an addition may thus be made

to the value of the crop; but, if done earlier, we apprehend there can be no doubt that it will occasion a serious injury."

In the second volume of the Farmer's Magazine is the record of another experiment in cutting the tops, which shows a great deficiency in the crop; the tubers were also ill-ripened and of bad quality where the ridges were cut, but, where left untouched, were excellent. In the Memoirs of the Board of Agriculture, Sir A. Grant states, that in his experiments "the cutting of the stems in every instance completely failed;" and a French writer of eminence says that, though the clustered sort of potato may be cut in September without injury, yet any other variety would suffer by it materially. In corroboration of these statements we may mention, that last season a heavy gust of wind blew down part of the fence that enclosed our garden-lot, and gave admission to some cows. We had several beds of fine-looking carrots, the tops very fresh and vigorous, and the greater part of these were eaten close to the ground. They sprung up again, but at the time of gathering there was a marked difference between the carrots that had been topped and those not touched, in favour of the latter. Some experiments have been made that seemed to favour the cutting of potato tops, or, at least, to show that no injury resulted from the practice; but in these cases it is reasonable to suppose that the roots were so far advanced towards ripening as not to be materially affected by the loss of the stems.

Potatoes are preserved through our winters with little difficulty, whether pitted in the field or stored in cellars of proper temperature. Potatoes, in gathering, should be as little exposed to the sun and air as possible—a fact taught by nature herself, in the greater vigour and perfection of roots that remain in the ground over the winter unfrozen. Such roots never fail of vegetating when planted, and they are

also far more farinaceous than those stored in cellars in the usual manner; a remark which in a considerable degree holds true of those carefully pitted and preserved in the field. General Barnum recommends lining the sides of the potato-vaults with fresh turf, the earth side to the roots, and covering them with the same material. This would be an unquestionable improvement in excluding the air, partially at least, and thereby preserving the root in a good degree of freshness until required for use.

There is scarcely any plant cultivated by man less subject to disease than the potato; though it may not be impossible that longer cultivation, without much care in propagating from seed, may at length break down the original native vigour of the plant, and thus induce disease. Two diseases only are known to which the plant is liable, the *scab* and the *curl*, and the last of these may be considered of recent origin. Insects rarely produce any serious injury either to the tops or the tubers; though the last are sometimes assailed by the wireworm, when planted in ground much infested by them. Loudon remarks, "that the *scab*, or ulcerated surface of the tubers, has never been satisfactorily accounted for; some attributing it to the ammonia of horsedung, others to alkali, and some to the use of coal-ashes. Change of seed and change of ground are the only resources known at present for this malady."

But the most fatal disease is the *curl*, "which is known from the leaves of the stem becoming shrivelled, when the roots are found in a state of partial decay, and finally turn rotten."—*Brit. Hus.* Much speculation has existed on the nature and cause of this disease; it has been supposed to be occasioned by the use of over-ripe tubers as plants; by the roots of a particular species becoming tired of the soil in which they have long been grown; many impute it to the attacks of a small insect which adheres to and preys upon the stem, and which may, it is sup-

posed, be prevented by dressings of lime, soot, and tobacco-water; others suppose it is a disease communicated by the sets, in the same manner as in unsound seed; it has been charged upon frosts, either before or after the sets were planted; planting sets cut from large unripe potatoes; planting too near the surface, or on old, worn-out land; and, finally, Mr. Shirreff, "an ingenious speculator and practical agriculturist, is of opinion that only two causes can be assigned for the curled disorder in potatoes. The first is excessive seed-bearing, that is, carrying great quantities of apples; from the effects of which, if the plant be not too far advanced in life, it may recover for a time. The second cause is time or old age, which never fails to bring the curled or shrivelled disorder, followed by death, on the whole animal and vegetable kingdom."

From the very statement of these varying opinions, most of them from men and societies of acknowledged celebrity in agriculture, it is clear that, as yet, but little is known respecting the cause of the disease or its remedy. In the words of a writer in the British Husbandry, "It probably arises more from the temperature of the seasons in different years than from any cause that can be controlled by management; but we conceive that it may in some measure be guarded against by occasionally changing the species grown upon the soil, and by always paying close attention to the quality of the roots from which the sets are to be cut, and choosing them from those of the most fresh and perfect growth. Plants which come up curled should be treated like weeds, and hoed out, which evinces the propriety of retaining more than one eye in a set, so as to allow of cutting out the diseased plant without creating blanks."

In this country the disease is a new one. One of the first notices we have seen of its existence here was that given in the Genesee Farmer, from the pen

of Mr. Rhodes, of Skaneateles. Last summer was the first time we ever saw a plant so diseased; farmers in the United States can consequently have had little, if any, experience in relation to the complaint, and few opportunities of judging as to the cause. If we may be permitted to hazard an opinion in the matter, we should say the first cause assigned by Mr. Shirreff, viz., producing large quantities of apples, was as probable a one as any. All plants are weakened by the production of seed, and this effect is in proportion to their abundance. With many plants, when the seed is formed and ripened, the functions of vitality are ended, the purpose of their existence is accomplished, and, though some may not perish in the effort of ripening the seed, still, in all, this process must have a tendency to cause the decay and death of the vegetable. Where this tendency exists to any extent, the constitution of the plant is destroyed, and, though it may make some attempt to carrying on its accustomed functions, they must become more and more feeble; the plant will indicate this deep-seated weakness, and disease and death is the result. Men and brutes furnish analogous instances of this constitutional decay in races, families, and breeds; and exhibit the necessity of resorting to "first principles" to restore pristine soundness and vigour. Plants, like animals, are destined to decay; but, like them, the degenerated races can be renewed and improved indefinitely. New varieties of the potato must be propagated from the seed; and perhaps it would be well, where there seems a great disposition to produce apples, to adopt the plan so strongly recommended by some European writers (as adding to the crop from 30 to 50 bushels of potatoes per acre), of carefully picking off all the blossoms on their first appearance.

It appears from the foreign agricultural periodicals, that great loss is annually suffered by farmers from a failure of their potato sets, and that the evil

within three or four years has rapidly increased. Many who plant from ten to fifteen acres have experienced a total failure from this source. As in the case of the curl, the reasons assigned for the sets not vegetating are very numerous and somewhat contradictory; thus proving that, though it is a matter of great interest, little has yet been discovered that throws light on its cause. Some attribute the failure to the modern system of cultivation, in deferring planting to a later period, and taking up the crop in an immature state. Others, and of these Messrs. Macdonald, to whom the premium of the Highland Society on this subject was awarded, ascribe it to the heating of the seed, and to that cause alone. Others, to the crops of late years being suffered to stand so long before gathering, that the tender buds and surface of the tubers are often affected by the frost after being dug, and before they are pitted. Others, to the mildness of the winters, in conjunction with improper management in pitting and storing. Others conceive it to arise from the modern practice of cutting the sets, and placing the cut surface on the fresh manure of the drills. In examining patches that had failed, it was found that all the sets that had been laid with their skins upon the manure were sound, and putting forth vigorous shoots; while those in which the cut surfaces came in contact with the dung were uniformly rotten. Others have attributed the failure to insects generated in the cuttings, of which an instance is given, page 213, vol. v., Genesee Farmer. We think, however, that in most cases, the decay of the cuttings, or their indisposition to vegetate, may be traced to the fact of their being cut for several weeks before using, as it seems is the custom, and the cut surface, thus exposed to the action of the atmosphere, begins to decay before it is put into the ground. From the general testimony of foreign agriculturists, however, it appears evident, whatever the cause of decay in

sets may be, that whole tubers, if in a sound state, or if left in the ground during the winter, never fail to sprout, which proves that the skin can resist injuries that are fatal to the uncovered pulp; and that, "whenever 'maggots' have been found in the decayed sets, they have been a consequence, and not a cause, of the partial or entire decomposition of the sets."

As an artiele of food for man, the value of the potato is greater than that of any other root that can be grown in temperate latitudes. Mr. Cobbett made a ferocious attack on the potato; and he attributes the wretched condition of Ireland to the introduction of that root. We should imagine, however, there were causes at work in that island sufficiently active to produce the intense misery of the wretched peasantry there, without calling in the aid of potatoes. According to Davy, 1000 pounds of wheat contain about 950 pounds of nutritive matter, and the same weight of potatoes about 250 pounds; though different varieties vary much in this respect, those kinds that produce the most farina or starch being of course the most valuable in this respeet. One pound of wheat is therefore equal in nutriment to four pounds of potatoes; but, as experience shows that land which will produce from 20 to 25 bushels of wheat per acre, will grow, when properly cultivated, from 175 to 225 bushels of potatoes, it follows that an acre of land in potatoes will yield as much nutriment as two acres of wheat. It is probable, from the relative proportion which the actual nutriment should bear to the amount of food necessary to produce a proper distension of the stomach, that potatoes would be more suitable for food, if used alone, than wheat.

As food for animals, for feeding horses, fattening cattle, and particularly for making pork, potatoes are most valuable. In all cases, however, where their full benefit is expected to be realized, they

should be boiled, or, rather, steamed before using. The large quantity of water they contain in proportion to the farina proves the necessity of this practice in their preparation as an article of food.

The farina or flour of potatoes is the best produced from any plant, and is used in large quantities by those bakers that furnish the finest kinds of bread and pastry. The great superiority of the bread in Paris over that of any other European city is owing to the more extensive use of potato flour. It is calculated that from 40 to 50,000 tons of potatoes are used for making flour in the immediate vicinity of the French capital; and extensive manufactories, worked by steam, for reducing the roots to pulp and extracting the starch, have been erected. The starch, after being washed from the pulp, is thoroughly dried, then ground, and packed in sacks for use. Potato flour can be kept an indefinite time without becoming sour or losing its fine qualities.

Potatoes, in addition to their valuable qualities as an article of food, can be used for several other purposes. They make excellent molasses; and a large manufactory of this substance was carried on for some time by Mr. Guthrie, of Sackett's Harbour. No method of crystallizing the molasses, or making it into sugar, has yet been discovered, though it is not improbable, were the attention of chymists directed to that point, it might be done. The greater quantity of sugar contained in the beet will, however, it is likely, prevent any effort to extend the manufacture from the potato.

"The pulp of the potato from which the starch has been extracted is much used for cleansing woollen goods, a property it possesses without injuring their colour; and the water decanted from the starch powder is excellent for cleansing silks, without the least detriment to the colour."—*Loudon.*

In the North of Germany, Prussia, and in Russia, immense quantities of ardent spirits are made from

potatoes. Perhaps in no part of the world, unless we should be obliged to except some parts of the United States, is drunkenness more common or more cheaply purchased than in the countries named. The greater part of the *brandy*, as this liquor is called, is made from potatoes; and, when they have been partially frozen, the quantity and proof of the spirit is much increased.

As potatoes are valuable in proportion to the farina they contain, it may be remarked, that, in determining this point, reference must be had to the time of examination, as it has been proved that the roots contain nearly double the quantity in November that they will when preserved until May. Germination destroys the farina, as it does in wheat; hence potatoes sprouted, or wheat grown, are unfit for food. In conclusion, we may remark, that Dr. Tissot objects to the use of potatoes as food for man; not because they are unhealthy to the body, but because they injure the faculties of the mind. He owns that those who eat potatoes may grow tall and acquire a large size, but doubts if a literary work of merit has ever been produced by a potato-eater.

CHAPTER XI.

THE TURNIP.

Value of the Turnip.—Varieties.—Seed.—Soil and Preparation. —Sowing.—Drills.—After-culture.—Good Crop.

One of the most striking proofs of design shown in the order of creation, and a most beautiful illustration of the wisdom and beneficence of the Deity, is found in the fact that, as the population of the

earth advances, the means of subsistence are found to increase in an equal, or even greater ratio. In the early periods of history, famines were frequent and terribly destructive; while in modern times such an event is never known, and this, too, notwithstanding the number of inhabitants is some five or six times as great as it was at the periods alluded to. The reason for this improved state of things is to be found in two causes: a more safe and productive system of husbandry, and the introduction of new vegetables and plants into general use as articles of food. The first of these new substances, we may notice, is maize or Indian corn, which, introduced into Europe immediately after the discovery of America, has made the circuit of the globe, and now furnishes food to millions. The potato succeeded maize, as a gift from the New World to the Old; and, if its spread was less rapid at first, it has become far more general and extensive at the present time, being found adapted to latitudes where maize will not flourish, and, wherever it succeeds, doubling the means of subsistence upon the cultivated grains. The introduction of the turnip into general use has had an effect to increase the means of subsistence but little inferior to that of the potato; not, as in the case of that root, by directly furnishing food for man, but by so greatly increasing the productiveness of the soil in nutritive matter, that, wherever its culture as a field-crop has spread, it has exerted a surprisingly beneficial effect on the interests of all connected with agriculture, as well consumers as producers.

The culture of the turnip as a field-crop in Britain was introduced from Germany, and, in the opinion of the celebrated writer on statistics, M'Culloch, it has added to the annual value of English agricultural products more than 60 millions. It is there the foundation of alternate husbandry, and has contributed more than any other improvement in rural

economy to the enriching of the soil and the advancement of agriculture ; and the general testimony of farmers in this country is fully as decided as to its value. Turnips feed cattle and sheep; these furnish manure; and this, applied to soils that formerly produced little or nothing, has, in the modern course of rotation, rendered them productive in the highest degree. No man who pretends to the character of a farmer should neglect the cultivation of this root, as there is probably no way which, on proper soils, so great an amount of nutritive matter can be obtained from so small a space or with so little labour.

According to the best English writers on the culture of the turnip, the soils best adapted to this root are those which are light, dry, and friable. The British Husbandry says, " The soil best adapted to the turnip is of a dry-bottomed, free nature, of some depth and fertility ; * * 'light, dry, friable ;' * * 'consequently, exclusive of heavy clays.' " Loudon says, " The soil for turnips should always be of a light description. The turnip cannot be advantageously cultivated on wet, tenacious soils." With these authorities the experience of turnip-growers in this country perfectly agrees. All who have written on the subject from their own experience are unanimous in the opinion, that clay lands, or those where a hard, tenacious subsoil or hardpan is near the surface, are unfit for the turnip culture. A rich, friable loam, in which the tap-root descends without difficulty, is to be preferred ; but almost any soil, not of the above-excepted kinds, and dry, will produce turnips ; though the best quality of roots or the greatest quantities are not in such cases to be expected.

The kinds most generally used in field-culture are the White Norfolk Globe, the Yellow Aberdeen, and the Ruta-baga, or Swedish Turnip ; in this country, however, where turnips are never, or very rarely,

fed off in the field, as is customary in Britain, but reserved for winter feeding principally, the first two kinds are little sown, and attention is mostly fixed on the ruta-baga. Of the varieties named, the ruta-baga is decidedly the most valuable, containing the most nutriment in a given quantity of root; being the hardiest species known, the frost that destroys others has little effect on this; and it keeps sound and good to a much later period in the season than the other kinds. The true sort has yellow flesh, and is without a stem; but it is apt to degenerate, either by the flesh becoming white, or by the crown running up into a stem of greater or less length.

It is evident that the common farmer must depend on purchasing his seed; and it is to be regretted that there is no certain method known of determining the pure from the impure. In examining samples, they are found to contain more or less seed, green, yellow, red, and black, which latter colour, when bright and the seed plump, is one of the surest indications of good quality. If the green and yellow seed are compressed, they will be found to contain but a small quantity of oil, and must be considered as unripe. Such seed will vegetate, but, like every other immature thing, it feels the want of sufficient body, and comes to little or nothing. The black, full-bodied seed, though this is sometimes adulterated by rape-seed, is the kind we ought to choose. Seed of this kind, where the grower or the seedsman can be depended on, rarely fail; but, to determine their vegetative powers, it is a good plan to test them by sowing a dozen seed at different times or in different places; and, by observing how many of them grow on an average, we can safely apportion our seed to the acre, from a pint to a quart, or even four, according to the proportion of vegetating seed. There is, unquestionably, a vast deal of inferior seed sold to the public as genuine; and it is always safer to apply to seeds-

men who have acquired a reputation for accuracy, than to trust to dealers who care but little what kind or quality of seed they vend. A pound, drilled, will furnish an abundant supply of plants for an acre; and if the seed is good, and could be properly distributed, a much smaller quantity would suffice. Some farmers use more seed, that, if attacked by the fly, the chance for escape of a sufficient number of plants may be greater.

As regards the time of sowing, it may be laid down as a general rule, that those kinds which are the most nutritious require the longest time to arrive at perfection; and, of course, the Swede should take the preference of the Globe or Aberdeen. In England they sow much earlier than we do, or than would, perhaps, be advisable in this country; the crop being put in from "the beginning of April and throughout May. * * The third or fourth week in May is the time most generally adopted, but in every instance the sowing should be deferred until the ground is in a perfect state of dryness, or in a proper state to promote rapid vegetation."—*British Husbandry*. In the culture of the turnip, we have sown earlier than has generally been recommended in this country, say from the 15th to the 20th of June, and have experienced no bad results from the practice. From the 25th of June to the middle of July has been recommended; but we should prefer the earlier to the later period, if the ground can be put in equally good condition for the seed.

The preparation of soil for turnips can hardly be too thorough and complete. It should be ploughed, harrowed, and rolled until it is brought to a perfect state of pulverization. "The root-weeds should be carefully raked up, and either carried to the dunghill or burned upon the land, and nothing should be left undone to bring it into a state of good tilth; that is to say, clean, dry, free from lumps and clods, finely reduced, and wearing the appearance, both to the

eye and touch, of kindly mellowness." In manuring turnip-lands, it should be remembered that root-crops can scarcely be manured too high; and, whether the seed is to be sown broadcast or in drills, manure should be applied liberally. As drilling, or sowing the seed in rows, is most generally practised, and in ordinary cases is to be preferred, the preparation of the land for manuring and sowing is as follows:

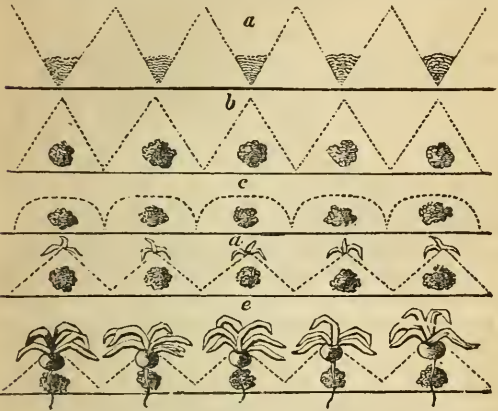
The soil, prepared as above described, is thrown into ridges by a plough with two mouldboards or by the common plough, the ridges having a sharp top, and being at the distance of from twenty to thirty inches from top to top. If the whole cultivation is to be performed by hand, the ridges may be at the least distance named; but if, as is always advisable, the horse-hoe or cultivator be used, they cannot be much nearer than the greatest distance named.

The manure should be well-rotted barnyard manure, compost, or what in England is called spit-dung, and the quantity as large as can be afforded. After the ridges are formed, the manure, in carts or wagons, is hauled on the ground, the wheels passing between the ridges, and the manure, thrown out at convenient intervals, is immediately dropped or placed in the furrows. Figure *a* (p. 187) shows a section with the manure deposited in the furrows.

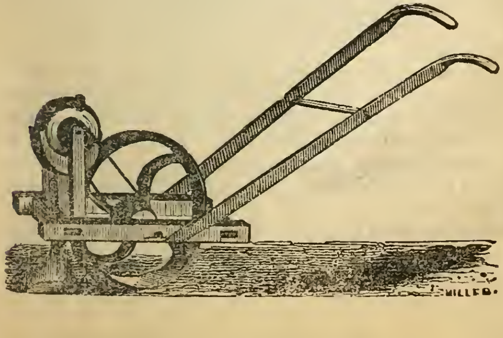
As fast as the manure is distributed in the furrows, it should be covered, which is effected by splitting the ridges with either a double or a single mouldboard plough, forming a new ridge on which the seed is to be sown directly over the manure. Figure *b* (p. 187) exhibits a section of the new ridges.

The seed should be put into the earth as soon as the ridges are prepared for its reception, while the earth is fresh and moist, the more rapidly to promote the germination of the seed. Sowing by hand has been generally superseded by machines for drilling in the seed, as they save time in sowing, and, by distributing the seed more evenly, a less quantity is

sufficient for an acre. Two active men will, however, sow an acre a day by hand, one forming a small furrow on the ridges by drawing a hoe over



them, and the other dropping the seed. To do this well requires some experience, while with the drill any man can sow an acre in an hour or two, and place the seed in a better manner. The following cut represents the drill-barrow invented by Mr. Be-



ment, of Albany, one of the most perfect instruments of the kind; and we also annex a description of the implement furnished by the inventor for the Cultivator.

The principle of this machine differs but little from the one described in the Monthly Genesee Farmer. The improvement consists in substituting copper and block tin in the place of a tin cylinder, with large holes for mangold-wurzel, beets, and small pease, and a band which can be slipped over the large holes, in which are pierced smaller holes of two sizes, the larger size for onions, carrots, and other seed of a round or oval shape not larger than onion-seed. By slipping the band, and placing the smallest-sized holes over the larger, it is then prepared for ruta-baga and other seed of the same size.

The wheel by which it is impelled serves the double purpose of covering and of pressing the earth to the seed, thereby causing a much more rapid vegetation.

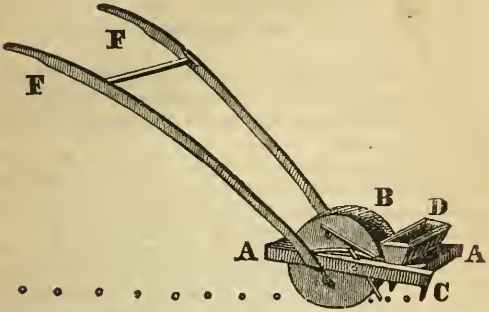
The objection to the former coulters through which the seed dropped is completely obviated in this; for the coulter and seed-tube are separate, which renders it almost impossible to be filled with earth.

Another advantage this has over the former is, the coulter being in front of the wheel, it may be run close to a fence or a tree.

It is also very substantial and durable. The wheel is of cast iron, sixteen inches in diameter and four inches broad.

A cheaper and simpler instrument has been invented by Mr. Merchant, of Guilford, Chenango county, which, with some modifications, is in extensive use in the middle counties of the state. It is better adapted to sowing turnip than any other seed; with this it makes very good work, and costs, ready for use, but about two dollars. By passing a drill over the ridges, the tops are somewhat flattened, and exhibit

something of the appearance shown in the figure *c* (p. 187).



" A A are the two sides of the frame, 16 inches long, connected at each extremity by cross-pieces. B is a wheel, 10 inches in diameter and four inches broad, made of wood. C is a coulter attached to the forward crosspiece. D is the hopper, in which the seed is placed. F F are the handles by which the machine is impelled and guided. Back of the hopper is a roller, attached to which is a metal slide, not perceptible in the cut, perforated with a hole of the size of the seed to be sown, which slides close to the bottom of the hopper. The roller is moved, when the machine is in motion, by stout wires seen in the drawing. When the machine is in motion, the coulter C makes a drill, into which the seed immediately drops ; two pieces of round iron project down diagonally from the sides, which throw the mould upon the seed, and the wheel then passes over and operates as a roller."

After the sowing has been completed, the plants generally make their appearance in ten or fourteen days, and if the soil and weather be favourable, they will grow into what is called the " rough-leaf" when

they are about two inches high. The process of horse-hoeing then commences, by running a small single-horse plough up and down between the rows, as near as it can pass without injury to the crops. The result of this first ploughing is shown in figure *d* (p. 187).

Sometimes, instead of the horse-plough, the cultivator is taken for the first dressing, the wings being guaged to the proper width, and stirring the earth between the rows.

"Within two or three days afterward, the operation of hand-hoeing commences, which is performed by the labourer going along the drills with a gardener's hoe, having a blade of about eight inches in breadth. With this he stands opposite the rows, and at one stroke across the ridge he cuts out the plants at regular distances, leaving them standing singly, with a vacant space of at least nine or ten inches between each; thus thinning them sufficiently, and leaving room for the roots to grow to the proper size."

Within a fortnight or three weeks the weeds will again spring up, and the horse-hoe must be again passed between the rows, and the plants cleaned by hand; all sprouts are now cut out, and care taken to leave only single plants in the ridges.

This horse-hoeing generally concludes the culture, as the leaves are now broad, and, covering the soil, prevent in some degree the growth of weeds; but sometimes, if the weather is unusually moist and warm, it may be advisable to turn back the earth taken from the plants by these several hoeings, using the plough employed at the first dressing, and cleaning the plants after the plough with the hand-hoe. A glance will show the appearance of the rows, and also that the ridges will in this way be kept drier than in any other, a thing of consequence where the soil is inclined to be moist. The plant will now grow rapidly without farther care, the leaves of a

good crop covering the entire surface, and exhibiting the appearance seen in figure *e* (p. 187).

The product of the turnip crop, though always valuable, varies much according to the soil, manure, and culture. The average in this country may be stated at about six hundred bushels per acre, though crops of one thousand bushels are so common as to excite little surprise or remark. The Swedish turnip is more solid and heavy than the common turnip, and its nutritive properties are in about the same proportion. Dickson, in his survey of Lancashire, states "that, on weighing a Winchester bushel of good roots of the ruta-baga and the common turnip, the first weighed 88 lbs. and the latter only 60, a statement which has been confirmed in many instances by other experiments." Davy states the nutritive matter in the common turnip at 40 parts in 1000, and that of the ruta-baga at 64 in 1000; and the rate at which they are eaten by animals shows that the chymist was not far from being correct in his estimation of their respective products. In the Northumberland Agricultural Report it is stated that, "on the 16th of March, four tups of the New Leicester breed were put up in one pen, and eight draught ewes in another, to be fed on common Norfolk globe turnips, freed from their tops and fibrous roots. In eight days the four tups ate 1003 lbs., or, on an average, 31 1-2 lbs. per day. In eight days the eight ewes ate 895 lbs., or, an average, 15 1-2 lbs. per day."

The whole were then put on Swedish turnips, sliced, weighed, and given regularly three times a day; of which, in eight days, the four tups ate 553 lbs., averaging 17 1-2 lbs. per day. The eight ewes, in the same time, ate 544 lbs., averaging 8 1-2 lbs. per day.

It may be remarked, however, that an experiment in November might not show so great a difference as the above, as the common white turnips grow light

and less nutritive much earlier in the season than the ruta-baga. Von Thaer estimates the value of turnips when compared with hay as 100 to 22; that is, 22 lbs. of hay are equal to 100 lbs. of turnips.

A multitude of instances are on record in which astonishing crops of turnips have been produced; but we have noticed few in which a better crop, considering the quantity of land cultivated, has been produced than the one mentioned in the following extract of a letter to the editors of the Cultivator from a gentleman in Susquehanna county, Pennsylvania.

"Although my turnips were injured by the fly, the grasshopper, and the drought, I have succeeded in raising a large supply of ruta-baga. The spot contained 486 square perches, where the hardpan is nearer to the surface than on any other part of my farm. My two turnip-houses average each a *little more than* 3000 cubic feet; they have been both filled to the brim, and 76 bushels over. You may calculate the number of bushels: I would do it myself if I were not apprehensive of having my credibility questioned. Many of the turnips measured three feet in circumference."

We have complied with our friend's permission to calculate his crop, and find it to be 3758 bushels, *heaped measure* (of 2815 cubic inches to the bushel); and as the land on which they were grown was 486 square rods (three acres and six rods), the amount per acre was 1252 bushels. A most irrefragable proof of good soil and good farming.

CHAPTER XII.

SUGAR-BEET.

Its Value.—Soil and Preparation.—Culture.—Harvesting.—Feeding.—Product.—Seed.

[It is the opinion of some of our best farmers, that, owing to the difference of the climate, the turnip, which has so revolutionized the agriculture of England, will not succeed as well here. Should such be the case, a most admirable substitute is at hand in the sugar-beet, which, as yet, has rarely failed in producing excellent crops. Of the value of this root for stock generally, and milch cows in particular, there seems to be but one opinion, and that most favourable. Having had little experience in the culture of this root ourselves, we have selected for the substance of this chapter a communication from a gentleman whose name is a sufficient guarantee for the correctness of the opinions and statements which it contains.—*Editors.*]

Of the different species of roots for the support and sustenance of stock, the sugar-beet seems destined to become the most extensively cultivated throughout North America. It is finer grained, sweeter, more delicate and agreeable to the taste than mangold-wurzel, and, at the same time, is more nutritious, gives as large a yield, and is equally thrifty and hardy, and as susceptible of an extended cultivation in the various latitudes. Fed raw, it is pre-

ferred alike by the horse, the ox, the cow, the sheep, and the hog to every other root, with perhaps the exception of the parsnip; and cooked, it is only inferior to the most farinaceous kinds of the potato. It makes the finest wool, the most juicy and delicate meat, the largest quantity and richest quality of milk and butter in winter, not inferior to that produced from the sweetest pastures in summer. When not grown too large, it also ranks high among table edibles; and is perhaps the most luscious and palatable of roots to the taste of man. Being then the largest of yielders, the most certain of crops, the easiest handled, secured, and fed, and, above all, a great ameliorater of the soil on which it is grown, we think we are not over sanguine when we assert that, in a very few years, its cultivation will become so extended as to make it the largest and most valuable of our root productions, and that it will work out in the United States even a greater wealth and independence to the agriculturist than the growing of turnips has in England.

Of the probability of the beet rivalling the cane in the production of sugar, we shall speak in a future number: it is sufficient in this to know that, as food for man and beast, it deserves paramount attention, and it is to be hoped that all those who have engaged in its cultivation will endeavour to extend the knowledge and practice of it as much as possible in their respective neighbourhoods. With a view of adding his mite to so desirable an object, the writer subjoins below such information as his limited experience enables him to give.

Soil and its preparation.—The best soil for the production of the sugar-beet is a deep, light, and moderately rich loam, resting on a clay subsoil; but very large crops have been taken from thin gravels and sands, and the hardest clay; in these cases, however, they had undergone a potato cropping and manuring the preceding year, and had received a

slight covering of compost, ashes, plaster, or lime the spring they were planted in beets. A very rich soil, such as the deep alluvial bottoms of the West, is not so proper; the roots grow too large and rank in it, and are consequently coarser and less nutritious, and do not abound with near the saccharine matter that is found in those grown on poorer ground

Plough deep, and roll and harrow fine, and have the ground in lands of about one rod wide, with the furrows between them well hoed out, so as to drain the falling water off, especially if the subsoil be at all tenacious, as most of the Western lands usually are.

The seed and its preparation.—The white Silesian sugar-beet is the best variety, being sweetest, the finest grained, and growing the largest. Soak the seed at least two days previous to planting in soft tepid water, and then roll it in plaster or ashes so as to prevent its sticking together. It is indispensable that the seed be well soaked; otherwise, owing to its outward coating, the pericarp, being very hard, it may not vegetate at all, or so late as to make a fair crop out of the question. I have frequently had it in soak a whole week, and sowed the seed when already well sprouted; and, though followed by long heavy rains, they were the quickest up, and gave the largest produce. The first and second weeks in May are the most proper time to plant in this latitude; farther north or south, of course later or earlier, according to climate.

Planting.—It can be sown broadcast like the turnip; but, as weeds are likely to spring up in most soils and prevent its growth, and the labour of exterminating them is much greater in this way, it is preferable to sow in drills. For this purpose, the drill-barrow may be used the same as in planting the ruta-baga; but the beet seed is much more difficult to deliver evenly through a small aperture than the turnip, and, though I have used a great variety

of barrows for this purpose, I have never yet had one that worked well and could be depended upon, especially in tenacious or heavy, loamy soils. It is preferable, therefore, to take a piece of joist four inches square, or a round stick of the same diameter, half or just as long as the lands are wide. Fill this with iron or wooden teeth, in wedge shape, as far apart as you wish to have the rows; put a pair of fills to it, and hitch on a stout man or steady horse, and once or twice going through the land completely drills it from one to two inches deep. Then follow immediately with the seed, dropping it by hand, or from a long-necked bottle, or a tin cup with a hole in the bottom, and a stick handle attached to it, shaking the cup or bottle as you walk along, and following sharp with the eye to see that the seeds are evenly dropped. Careful children of ten years old can do this with more ease and facility than grown persons. As fast as the seed is dropped, cover it with the hoe; in heavy soils, about half to three quarters of an inch deep; in sand or light gravel, twice this depth.

The rows may be from one to three feet apart for a field-crop; two and a half to three feet is the best. This distance enables one to use the cultivator for weeding without danger of cutting or covering the plants as it passes through the rows. The product is not so great per acre from wide rows; but land being cheap and labour dear in America, we must study to facilitate manual operations at the same time that we have reference to a good yield. Four pounds of seed per acre are generally considered enough, but it is better to have a dozen extra plants to thin out than to be obliged to transplant one. Those transplanted do not thrive half as well as those that remain where they vegetate; besides, the labour of transplanting is more expensive than extra seed and the time required for thinning. I therefore mean, in sowing, to have a good seed

dropped as near as every two or three inches in the drills.

After Culture.—As soon as the weeds begin to appear, run the cultivator through the rows, and follow with the hoe. It is very essential that the ground be kept clear of weeds, especially for the first two months; and three hoeings, with the use of the cultivator, are generally sufficient for the season. As the plants attain a height of about three inches, they should be thinned to a distance of about four inches, leaving the strongest and healthiest; then, as they increase in size, gradually thin out the remainder, leaving the roots in the rows at least nine or ten inches apart. If left too thick, they shade and choke each other in growth, and the product is not so great as when well thinned. The plants drawn in thinning are valuable to feed stock during the summer, and are frequently considered equal to half the expense of cultivating the whole crop.

Harvesting.—Chaptal decides, that when the leaves begin to decay and turn yellow, it is the best time to gather the beets; for, if left longer than this in the ground, the roots grow hard and strong, and do not yield so great a per centage of saccharine matter. This, of course, will take place earlier or later in different climates; and it is undoubtedly as good a rule as can be given, having been adopted after a strict chymical analysis of the beet in its growth by that eminent agriculturist. If the soil be light, as the roots generally grow so much out of the ground, they can be pulled up by taking hold of the tops with the hand; but, if more tenacious, the dung-fork is the best instrument that I know of for digging them up. Let part of the hands be thus employed, and the other part follow with large knives or bill-hooks, taking up the root with one hand, and topping off the leaves with the other. The roots should be thrown into small heaps to dry through the day; and, if left out over night, and there be danger of

frost, let them be lightly covered with leaves or straw; a hard frost injures them, and makes them more liable to decay. They may then be taken to a well-ventilated cellar, or be pitted in heaps of 100 to 200 bushels. The beet is rather apt to heat and commence sprouting if thrown into large heaps or packed away in the cellar. If put in the latter place, any other roots except the turnip may be placed at the bottom, and the beets on top; and if in pits, the same roots or straw may be put in the centre. All the beets then have a good ventilation, and an opportunity of throwing off the impure air; and to facilitate this, after covering the heaps with dirt, holes should be made every few feet on the top of them, and wisps of straw placed in such holes. In this way the writer has experienced no loss or deterioration in the value of the roots, but has preserved them till May as fresh, sound, and sweet as when first taken from the ground the preceding fall. In a climate as mild as South Ohio, they might be preserved all winter in tolerably tight sheds and barns.

Feeding.—Throw the roots on to the ground or floor, and take a hay-knife or spade, and a man will slice up a bushel a minute sufficiently fine to prevent cattle from choking with them. The best way to cook them for stock is by steaming; but they cannot be kept after being cooked over two days in warm weather, and a week in cold, without undergoing fermentation, and thus losing the saccharine matter so grateful to the taste and so essential to nutriment. Either raw or cooked, my stock frequently prefer them to meal or corn. In a raw state, I think them as nutritious as any root whatever; and, as far as my limited experience extends, three bushels of beets with neat stock is equal to one of Indian meal. Hogs demand less bulk to fill themselves than cattle, and perhaps their value to them would be about as four to one.

Product.—Four hundred bushels per acre is a fair yield in field-culture, but six and eight hundred is about as common. The writer grew at the rate of 1150 bushels to the acre the past year, on a hard clay soil; and his average field product was about 600 bushels on the same soil. He has heard of 3000 bushels being produced to the acre on rich loams. Several of my roots the past season weighed 16 lbs. each, and 10 lbs. is not unfrequent. Now, admitting this last weight to each root, and that seven rows stood in the width of a rod, which would make them about two feet apart, and the roots one foot apart in the rows, and allowing 60 lbs. to the bushel, we should have the enormous product of 3080 bushels to the acre; but roots so large are coarse, stringy, and not unfrequently hollow, and have much less saccharine matter in proportion to their bulk than smaller ones. Those of about five lbs. weight are far superior; and these, standing one foot apart in the rows, with five rows in the width of a rod, making the rows about three feet apart, give the large yield of 1100 bushels per acre, which is quite as great a product as it is desirable to strive for, and is, upon the whole, perhaps the most profitable.

I see by most writers on beet-cultivation that the leaves are considered highly nutritious, and are recommended to be cut and fed to stock. I suspect that these writers had more theory than experience on the subject when they made such recommendations. I have universally found that the leaves badly scoured all kinds of animals, even when taken up from green pasture to feed on them, and, if persisted in, created disease. I have tried all sorts of ways to prevent this effect, by salting the leaves and mixing them with other food, but the result was the same. They have a sweetish-bitter, pungent taste, and I found, upon chewing the leaves, that the effect on man was the same as on beast. I know of no better use for them than to be left on the ground to

fertilize it for another crop. But it will be seen that the roots alone make it a very valuable crop, far more so than corn, or any of the smaller grains. The estimated cost of producing it ranges from three to eight cents per bushel; the average is probably from five to six cents.

Range of Latitude for Cultivation.—In North America, as high as 45° may be considered as one extreme for a profitable crop; but as to southern limits, I should try it, as an experiment, as far south as 30°. But in this low latitude it ought to be planted as early as from the 20th February to 10th of March, on a cool and rather moist soil, for the purpose of being pulled and fed green at the beginning of summer drought. Perhaps it would do well to plant between corn, making the rows a foot or two wider apart for the purpose of receiving the beet. The tall stalk would thus shade it from the excessive heat of the sun, and somewhat check its more rapid growth, and possibly tend to make it last longer through the summer. Should the beet succeed so far south, in this way it would prove a great assistance to stock-growers in getting through those months in which pasture, except in the woodlands, is completely dried up by the hot rays of the sun. I would respectfully recommend a thorough trial of it to the planter: it certainly may succeed as far south as Kentucky, and North Tennessee, and Missouri. I know men who in an hour will gather a sufficient quantity in a wagon for a large stock. It may be thus transported from the field where it grows to that where it is to be consumed, and scattered round in the same way that corn is now fed at the Southwest to cattle and hogs. I thus kept a large herd of hogs through September and October the last year.

Raising the Seed.—There is as much in choosing proper roots for this purpose as in selecting animals to breed from; and the same general rule holds good in both cases: a medium size, and fine, true form.

Roots weighing from four to six pounds, of from four to six inches diameter at the top, and from nine to thirteen inches long, smoothly and evenly tapering to a point, without straggling branches, of a cream-white colour and smooth grain, are the most desirable. "Like produces like," and with such selections followed up, the crop will soon run evenly of the same shape and size as the roots from which the seed was grown. Plant the seed-roots, and in this latitude about the first of May, three feet apart; and, as the stalks grow, stake round them in a circle, and tie a small cord from stake to stake for their support. As soon as the seed shells easily, which, if the roots are planted in May, will be in September, it is time to gather it. Two or three dozen roots will grow seed enough for acres, and at one tenth the cost it can be obtained for from the seed-stores. When grown at home, one knows what he gets; and as it comes to him abundantly and cheap, he can, without grudging, give to his neighbours, and thereby greatly promote the culture of this most valuable of roots. A. B. Allen.

Buffalo, March, 1840.

CHAPTER XIII.

SEEEP AND WOOL.

Early Domestication.—Flesh and Wool.—Fine Wool.—Improving its Quality.—Diseases and Remedies.—Shearing Lambs. —Shearing Sheep.—Attention to Sheep in Winter.

The sheep appears to have been one of the finest animals that yielded to the domination of man and submitted to domestication. In the most ancient zoological catalogue on record, it occupies a conspicuous

place. In the twelfth chapter of Genesis it is said that Abraham had "sheep, and oxen, and he-asses, and men-servants, and maid-servants, and she-asses, and camels." Some other animals were more obstinate, too proud or too self-willed to submit to his rule or claim his protection. Of these we may mention the horse and the hog, neither of which occupy a place in history for a long time afterward. The early domestication of animals seems to have been to furnish a supply of food; and in the patriarchal ages and countries, milk was, as it is now, the principal means of subsistence. Flesh does not seem to have been at this early period in general use as an article of food; and though, on extraordinary occasions, a lamb or a kid was slain, yet it is evident that flocks and herds were more valued for their milk than their meat. Clothing was plainly a secondary object with the ancients. It is clear that, like Moore's Susannah, they went "in very thin clothing, and but little of it." They approached the verge of nudity as near as decency would permit; and the wool, and fine linen, and ramskins died red, were all considered more as articles of luxury than of necessity.

But, whatever may once have been the value and uses of sheep, it would now be difficult, if not impossible, to find a substitute for them; and as supplying us with clothing, and furnishing a large portion of animal food, they fully deserve the care and attention they receive. In our climate there seems no alternative between the growing of wool and a clothing of skins; and in some countries, particularly England, the choice for the great mass of people lies between total abstinence from flesh and a leg of mutton. The use of mutton as food in this country is rapidly increasing; and the rearing of sheep that shall combine the greatest quantity of flesh with the best quality of wool, is receiving here, as in Europe, more attention than formerly. That these properties can ever be rendered perfectly compatible, is

improbable; nature seems to have ordered it otherwise, and all the efforts of breeders seem on this point to have been unavailing. The more constitutionally delicate the animal, and the less able to endure hardships it is, the finer and more silky appears to be the texture of the wool; and while the interest of the farmer demands hardiness of constitution and weight of carcass, the interest of the manufacturer is the reverse. Give him the finer qualities of wool, and carcass and constitution are with him secondary considerations; and, however much it may be regretted, it is clear that the interests of the wool-grower and those of the manufacturer are on these points not perfectly identical.

All things considered—the prices and demand for wool; the ease and chances of rearing; the weight of carcass and the value of the mutton—it would seem that medium qualities of wool, such as experience shows can be grown on heavy, strong-constitutioned animals, Merinos or otherwise, will be the most profitable for ordinary farmers, leaving the finer kinds to those who are able to devote their time and attention more fully to their flocks. Without more care and more expense in the management of their flocks than farmers are usually able to afford, the finest qualities of wool cannot be produced; and for almost every purpose, good, strong-fibred wool is preferable to weak, inferior wool, nominally of a higher grade.

The quality, strength, and softness of the wool are much influenced by the condition and health of the animal, and by the treatment it receives while growing. The chief care of the farmer should be directed to the health and good condition of his flock, as, if he is safe on these points, he has not much to fear on any other. To improve the wool as well as to guard against disease, the best wool-growers of Europe have adopted the practice of *salving the sheep*, as it is called. It is well known that some sheep, and

some breeds of sheep, yield a great deal of oily matter, which keeps the wool soft; and that the substance called yolk is on these animals more abundant than on the dry-skinned and coarse-wooled kinds. Smearing or salving is designed to supply this deficiency of oily matter, as well as to prevent all cutaneous diseases, such as the scab, &c.

The preparation used for this purpose is a mixture of tar and oil; but, when the quantity of tar is too large, it is found to be rather hurtful than beneficial, rendering the process of scouring difficult, and, after all, leaving a stain on the wool. This is occasioned by its separating from the grease with which it was mixed; and in such cases it accumulates on the sides of the animal, matting the wool, and serving as a receptacle for impurities. In too large quantities it has been found to be of an irritating nature, rather promoting than preventing diseases of the skin; but, when only a portion of tar is incorporated with the oil, its effects are good, both on the skin and on the wool. In the "Mountain Shepherd's Manual," a small but valuable work on sheep, published by the Society for promoting Useful Knowledge, it is said:

"Of late, several compositions have been proposed and extensively tried, in which the spirit of tar has been substituted for tar itself. This has been complained of, in some cases, as too irritating, and there is not a doubt that a too free use of spirit of tar is injurious, and even fatal. Some of the salves, while they prove perfectly well adapted to flocks that are clean, have been found ineffectual either in curing or warding off the scab: a disease which the common salve, made of tar and grease, seems effectually to resist. When a flock is perfectly clean, olive oil has been found to be the best substitute for softening the fleece, and warding off rain or snow. If a tar salve for smearing were made so as to be free from the impurities of the tar, it might probably an-

swer every purpose. The ordinary proportion of one cwt. of grease to a barrel of tar might be increased to one and a half cwt., and, when melted together, the impurities of the tar might be suffered to subside and be separated. In this way the tar might not leave a stain upon the wool when secured. Olive oil seems to impregnate the wool, or to adhere to it more firmly than any other greasy matter, and it has been extensively and successfully used by some of the best sheep-growers in the kingdom."

In this country, smearing to benefit the wool has not been generally adopted, though we think, where the scab is apprehended, it might be advantageously used.

There are many diseases of sheep complained of in Europe, and which frequently cause great loss to their proprietors, with which wool-growers in this country are, as yet, fortunately unacquainted. The complaint called the scab is, however, extensively disseminated in this country, and is yearly causing more or less damage and loss. This disease is infectious, and it rarely appears in a flock without a considerable number taking it. It seldom originates or spreads among sheep that have been smeared with the tar ointment, but it is sometimes communicated to them from infected animals. Sheep that have had poor food, and are consequently in a low condition, suffer the most from this disease. The true preventive is cleanliness and good keeping. When a sheep is affected by the scab, the wool appears fretted or started from the skin, is discoloured by a matter that seems to exude from the cracked skin, and the animal is disposed to rub itself against posts and fences. In ordinary cases, common smearing salve or ointment, with the addition of a little sulphur, will be found effectual. When the disease is not very far advanced, an infusion of tobacco, in the proportion of a pound to four gallons of water and as many of urine, will effect a cure. The work

quoted above recommends in severe cases an ointment of the following composition and proportions:

Corrosive sublimate	8 oz.
White hellebore, in powder . . .	12 oz.
Whale or other oil	6 gallons.
Rosin	2 lbs.
Tallow	2 lbs.

"The sublimate to be reduced to a fine powder, and mixed with a portion of the oil, and also the hellebore. The rosin, tallow, and the remainder of the oil are to be melted together, and the other ingredients then added and well mixed. Should the ointment appear too thin, the proportion of oil may be diminished and the tallow increased."

Before applying any remedies, the diseased parts should be well washed in soap and water, applied with a soft brush; and, if the wool is started or in the way, it should be at once cut off.

Few animals suffer more from the attacks of various kinds of flies than the sheep, and none are less capable of avoiding their annoyance. There is the *Estrus ovis*, which deposites its eggs in the nostril of the sheep, from which it ascends to the cavities of the head, producing constant irritation, and not unfrequently death. This fly is the most common in the latter part of July or August, and its presence near a flock may be known by the animals instinctively placing their noses as near the ground as possible to keep off the enemy, listening to catch the sound of his wings, and darting away, with their noses rubbing the earth, to a distant part of the field, to avoid the pursuit. Rubbing the end of the nose with tar, or spreading salt on tar to be licked off, furnishes the best preventive against this fly that has yet been discovered.

Another fly deposites its eggs around the roots of the horns and about the tail of sheep; where, if unmolested, they form deep ulcers, and the poor animal runs the risk of being devoured alive. Dr.

Parry recommends the following ointment to be well rubbed in around the horns and the tail, as it will compel the flies to change their place of attack or leave the animal.

Strong mercurial ointment	1 part.
Rosin	1 part.
Hog's lard	2 parts.

Melt the hog's lard in a convenient vessel, and add the rosin. When these ingredients are well incorporated, add the ointment (the common *unguentum* of the shops), and stir the whole till it becomes cold, to prevent the mercury from sinking. The proportion of mercury is too small to have any effect on the animal, but the least particle of it is fatal to any insect. Rubbing the head and tail with a composition of tar and train oil has been found to keep off the fly well, but it is not as fatal to eggs already deposited as the above ointment.

One word as to washing sheep. In England the common practice is to make them swim some two or three times across a river or pond; but, where regard is had to the marketable qualities of wool, it is evident that this process must be very insufficient. Here we see them sometimes driven for miles through dusty roads, and over hill and valley, to the washing; and, if well washed, as may by some possibility happen, by the time they arrive at their pastures again the colour of the wool can scarcely be discerned for dirt and dust. Almost every farm furnishes means of washing far better than either of these; a little brook and a large tub or vat are all that is required, and the whole may be placed in order in a few hours. In such a tub or vat the sheep may be washed cleaner, and without the danger and fatigue of carrying a wet fleece some two or three miles. A little soap, where there are large quantities of oil or yolk in the wool, will greatly assist in cleansing the fleece. After washing, the sheep should have a clean pasture, and the operation of

shearing should not be performed till the wool is thoroughly dried; and, if time elapses sufficient to allow the fleece to be again saturated with the animal oil, so much the better for the wool.

There are few of the processes in the management of sheep more slovenly performed than the one of shearing. The sheep is frequently most terribly mangled, and the surface of the animal, from the tufts and ridges of wool, is as uneven as a new-ploughed field. A gentleman in Columbia county, a few years ago, obtained leave of some of his neighbours, who thought their sheep were *pretty well sheared*, to have his shepherd reshear them as an experiment, and from two to four ounces were taken off at the second clip. Dr. Parry says:

"The closer wool is clipped, the better; and the way to effect this and to save time is to take but a small quantity into the shears. Neatness in shearing can only be acquired by practice. The only rules which can be written are, use shears of moderate size, and take up very little wool between them."

After being sheared, if proper regard is had to the comfort and health of the animal, and the quality of the next year's clip of wool, the following unguent must be well rubbed on every part with a currying brush; and a little of the mercurial ointment may be rubbed around the horns and tail.

Train oil or seal oil	4 gallons.
Tar	½ gallon.
Oil of turpentine	1 pint.

This composition, well rubbed on, will materially aid in destroying keds and ticks, should there be any on the sheep, will give softness to the wool, and greatly relieve the animals from the irritating and tormenting attacks of flies.

Some diversity of opinion appears to prevail on the subject of shearing lambs among owners of sheep, but our experience is decidedly in favour of

the practice, for two reasons. The first is, the profit from the sale of the lamb's wool, which will average from thirty to forty cents per head; the second reason is, it keeps the flock almost entirely free from the great enemy of sheep, the tick; as, after shearing the sheep, if there are any ticks on them, they will take refuge on and torment the lambs; and the later shearing of these is almost certain to eradicate the whole. Experiments have shown that little, if any, loss of weight is sustained by the succeeding fleece, and the wool is certainly of a better quality, being free from those hairs that abound in the fleeces of most lambs.

"Dr. Parry recommends the shearing of fine-wooled lambs about the beginning of August, having found the hog (or yearling) fleeces grow finer when the lamb fleeces are removed. There does not appear to be any danger to be apprehended from the operation at that season of the year; and the wool will have time to grow to a sufficient length for defending the animal from rain, cold, and snow before winter sets in. His recommendation goes no farther than to fine-wooled lambs; but those of other breeds may not probably be hurt, if these do not suffer any injury from the operation."

If any of the flock at any time exhibit symptoms of disease, they should at once be looked to, and the evils, if possible, ascertained and corrected. The celebrated Saxony flocks of Prussia are at short intervals individually examined with regard to their health, the quality of their wool, and their constitutional delicacy or hardiness, and their value graduated accordingly.

If sheep are smeared or salved, the lambs are rarely troubled with vermin of any kind; but where they become infected with ticks, and the owner is averse to shearing, "a solution of white arsenic in water, in the proportion of an ounce to a gallon, or three pounds of arsenic to about fifty gallons of wa-

ter, and plunging the lambs into it, taking care that they do not dip their heads or taste the water, will destroy them all." Arsenic, however, is so dangerous a poison, and, wherever used, is so liable to produce mischief, that we would recommend an infusion of tobacco as being equally effectual, in this country as economical, and in every respect safe and preferable. Few animals better repay care and attention than sheep, and no one should think of making the business of wool-growing a profitable one who is unwilling or unable to spare to them the time necessary for this purpose.

The most critical period in the year for the sheep is shown to be the time of shearing. Divested of the dense covering it has so long worn, it is extremely sensitive to all changes of temperature, and feels the effects of heat or cold in a tenfold degree. If turned out where there is no place of shelter, the skin will be burned and excoriated by a hot sun, and a disease of the surface, not unlike the scab in appearance, will be induced. If, on the contrary, as is not unfrequently the case in our variable climate, a cold rain, with the thermometer at the freezing point, succeeds the days chosen for shearing, the sheep, if left unprotected, will suffer greatly from colds, should they escape being actually chilled to death, a result not very uncommon with the finer wooled and thin skinned kinds. A farmer of our acquaintance assures us, that last year a sudden change of temperature took place the day he finished shearing his flock; and, though he had them immediately collected and placed in shelter, some ten or a dozen were unable to stand, and were brought by his men to the sheds, and for some time it was doubtful whether the effects of so great and sudden a chill would not be fatal to most of them. His flock is of the best grades of Saxon and Merino; and though, by great care, all were finally saved, it furnishes a strong

proof of the fact already alluded to, that the finer the wool, the more delicate and tender the animal.

The general health of sheep, and, consequently, their profit to the owner, is so much influenced by the treatment they receive during our severe winters, that a few remarks on the *wintering of sheep* will not be out of place here.

In few kinds of business carried on by the farmer is care more necessary, or skill and attention better rewarded, than in the raising and keeping of sheep. The finer-wooled varieties of this animal—those from which the greatest profit is derived—are precisely the ones which suffer the most from neglect; and the inattention of the owner often subjects him to serious losses, which might, by proper precautions, be entirely avoided.

Sheep suffer most from maltreatment in the early part of winter; any injury arising from neglect then being, from the very constitution of the animal, very difficult to remedy afterward. There is a point in the descending scale to which, if sheep are once allowed to fall, all efforts to raise them are usually unavailing.

One great cause of the losses sustained in keeping sheep through our winters, is the allowing them to "shirk" for themselves too long in the fall of the year. Scattered over the fields long after the frosts have destroyed everything that is green, and perhaps after the earth is covered with snow, they gather a precarious subsistence, and are rapidly losing the flesh and strength which, with proper treatment, would enable them successfully to combat the rigours of winter, and what is termed the faintness of spring. Better collect sheep into their yards as early as the 1st of December, and commence their regular feeding, than wait until January before it is done, under the idea that in this way fodder is saved. There may be, indeed, a partial saving

of fodder, but far too frequently such saving of fodder is the death of the sheep.

Another thing that occasions great injury to our flocks is the keeping too many together. Observation must have convinced every farmer that a small flock of sheep will, with the same feeding, do much better than a large one, and that from forty to sixty is as many as can be advantageously kept together; yet it is nothing uncommon for men who call themselves good farmers to keep from one hundred and fifty to three hundred in a flock.

Another great defect in the common treatment of sheep arises from there not being proper attention paid to the individual health and strength of the animals when flocks are divided into sections. These things should be looked to with great care, since to put a few weak and sickly sheep with a flock of strong, hearty ones, is not only to ensure the loss of the former, but frequently to endanger the safety of the latter by the spread of disease. In such cases, the weak ones, which require the best of the food given to the flock, are obliged to be content with the refuse of the whole, or such as has been rejected or trampled on by the strong; and the result is as might be expected from such an unskilful mode of management.

Every man who keeps sheep should have one department of his flock devoted to his weak or sickly animals; and, as soon as he discovers one coming under either of these classes, it should be immediately taken and placed where it can receive more attention and better food than is required by those that remain strong. Sheep, when thus put into the hospital, as this division may be termed, should be fed with fine hay, roots cut fine and salted, oats in the sheaf, or an occasional handful of dry corn; and if, every few days, a quantity of pine or hemlock tops be given them, the effect will be good, as they furnish a green, and, for any sheep, a healthy change of food.

Those who wish to have their wool in fine order, and in such a state as to command the highest prices in the market, will pay particular attention, not only to their sheep having an adequate supply of food, but to the manner in which it is fed to them. Manufacturers dislike to have the wool they use filled with grass and other seed; and, from the additional labour such wool requires, usually compel the grower to submit to a deduction of some cents per pound. When hay is thrown from a stack or a cowhouse where sheep are about, unless some care is used, this result usually follows; as the animals are certain to collect under the falling hay, and their wool receives and retains most of the seed scattered at such times. So, too, when fed from the common elevated rack, their wool will be injured by the retention of seed dropped on their necks and backs in drawing out their hay.

To avoid this evil and loss, racks should be used the sides of which are perpendicular, and which are so low that the sheep, in getting his food, need not fill his eyes and wool with dust and seed. Several plans for very good racks have been presented in the volumes of the Farmer; and no one can fail of constructing good ones if he only avoids the errors of making them overhanging and setting them too high. No animal whatever should be fed hay without racks, though there are few cases in which their benefit is so decided and apparent as in feeding sheep. Where a number of sheep are kept together, and the hay for them is scattered over the ground in the usual manner, the whole flock will dog the heels of the feeder, and, by the time he has been the rounds, the hay is so dirtied and trampled upon that a large part of it is refused by the sheep and lost.

Some farmers maintain that drink and shelter are unnecessary, or that they are, on the whole, disadvantageous to sheep. This must be a mistake; for

on such matters the decisions of instinct may much more safely be relied upon than the mere opinion of any observer; and it is well known that sheep will always drink when they can find water, and seek a shelter, if it can be had, during high winds or severe storms. It is contrary to the order of nature that any animal should suffer injury from being kept comfortable. If the place of shelter is too small or is ill ventilated, sheep are injured by being crowded into such confined limits; but it is the height of absurdity to suppose that the health of a sheep, and, consequently, the quality of its wool, will not be better where care and comfort are attended to than where both are neglected.

CHAPTER XIV.

CHEESE-MAKING.

Comparative Quality of Cheese.—Rennet.—Attention to Temperature.—Gloucester and Stilton Cheese.—Products of a Dairy.

The greatly increased demand for the products of the dairy; the comparatively small amount of capital required for a beginning by the small farmer; the avoiding the expenditure that is necessary where several labourers are employed; and the increasing conviction that the profits of the dairy, if not as great as those of wheat-growing, are far more sure, have induced many of our farmers to turn their attention to this subject, where, with proper management, they are certain of an abundant reward for their labour. There surely can be no reason why cheese may not be made in the United States equal

to any in the world; yet, as a whole, there can be no doubt that American cheese is far inferior to that made in England, and some parts of Holland, Germany, and Italy. The causes of this inferiority must be sought in the defective modes of making practised in our country. We sometimes meet with a cheese equal in quality to any that can be produced in any quarter of the globe; but that, perhaps, is the only one the dairy that furnished it can show of a similar quality. Such would not be the case if the business of the dairy were carried on upon fixed and correct principles; as entire uniformity in the flavour and quality of their cheese is a marked characteristic of the best foreign dairies. As the result of some observation and experience, we give it as our opinion, that the reason why so much ordinary cheese is made in this country is, that little or no attention is paid to the quality of the rennet; and the temperature of the milk, being left to chance, is constantly varying from day to day, thus necessarily affecting the quality of the curds.

It is evident that the rennet must have a great effect in determining the good or bad qualities of cheese; yet in many, if not most of our dairies, it is prepared in the most careless, not to say slovenly manner. Everything relating to cheese should be kept perfectly clean; yet rennet is sometimes used, the odour of which is anything but ambrosial; and it is well if a close inspection does not show *living* proof that the invitation sent abroad on the tainted air has not been in vain. Some of our dairy-women maintain that the quality or flavour of the rennet is of no consequence, as anything offensive passes off in the whey; but this is a great mistake, as is well understood by those who have paid proper attention to the preparation of rennet. At the celebrated dairy-farm of Heyward in England, the rennet is prepared by putting two gallons of brine to six calves' stomachs, at least one year old, to which

is added two or three sliced lemons, and, after standing a few weeks, the liquor is bottled for use. It is not used till two months old; and, the older it is, the better it is considered. In some dairies, cloves, sage, and other aromatics are added to the rennet with the lemon. A stone jug that will cork tight is best for the preservation of rennet, as the air should be carefully excluded after it is once prepared.

To produce uniformity in the quality of cheese, the milk should be of a uniform temperature when the rennet is applied. This, in most cases, is left to chance, the hand of the dairy-woman being the only guide; whereas a thermometer ought always to be used, and whatever rate is adopted as the standard, the milk of each day should be made to conform to the rule. At the Heyward farm, and in others where double Gloucester is made, the standard is 85°. From that it ranges to 95°, which is the highest admissible in the manufacture of cheese, as a greater degree of heat renders the curd too hard and firm. Should the milk, when brought from the cows, and placed in a tub or vat for being converted into curd, be found to have sunk below the proper temperature, a quantity must be warmed sufficient to raise the whole to the desired point.

To a neglect of these two things, quality of the rennet and proper temperature of the milk, we believe most of the defects in our cheese are owing; and, were these difficulties obviated, we have no doubt that many of our dairies would produce cheese of uniformly good quality. Now, in purchasing a lot of cheese, the buyer is pretty certain of getting some that will be first-rate, some that are middling, and some that would choke a dog, so hard and tough are they. We read not long since, in some of the scientific journals, that the Germans had succeeded in converting pine boards into very palatable sixpenny loaves; and had they asserted that the same persons had converted a white-oak plank into cheese,

we should have been equally ready to credit them, as we have ourselves seen some that approximated marvellously near to that wood in outward appearance and inward quality, so far as hardness and toughness are concerned.

There are but two kinds of English cheese, the manufacture of which could be introduced into our dairies with much prospect of success or remuneration; these are the Gloucester and the Stilton, and in some of our dairies, at present, cheese nearly approaching these in quality is produced. In making both these kinds of cheese, there are some peculiar methods practised which must have a decided effect on the quality, but which have been introduced in full into very few, if in any dairies in this country. The double Gloucester is made from the night and morning milk, the cream being taken from the former. Single Gloucester is made entirely from skimmed milk. In making Gloucester the milk is set at the temperature of 85°. After the rennet is applied, when the curd is hard enough to break up, it is very slowly and gently cut with a three-bladed knife both ways (the blades reaching to the bottom of the tub, and being one inch apart), that the whey may come out as clear or greenish as possible. As the curd settles, some of the whey is dipped off and the curd again cut up. This operation is repeated until the whey is entirely separated, and no lumps remain in the curd. The curd is now put into the vats or hoops, and pressed down with the hand. The hoops, covered with fine cloth, are put in the press for half an hour, when the curd is taken out, cut into thin slices, and put into a wooden mill, which *tears* it into pieces not larger than small peas. This process of grinding is preferable to breaking up by hand, as the butter is not forced out, and the curd unites better than when made fine by chopping, as is generally practised in this country. In some instances, a second similar breaking up or grinding of

the curd is performed; and, after being made as fine as possible, it is again put into the cloths and hoops, a little hot whey or water being thown on the cloths to harden the outside of the cheese and prevent it from cracking. After being in the press two hours, the cheese is taken out and dry cloths applied; and the same operation of turning and dry cloths is repeated during the day. A striking peculiarity in the Gloucester cheese is the manner of salting. None is used until after the cheese is made and has been in the press twenty-four hours; and even then no salt is applied unless the cheese is perfectly closed, since, if there be any crack at the time of salting, it will never close afterward. The process is performed by rubbing the cheese over with finely-powdered salt, after which it is returned to the press. The salting is repeated three times with the single, and four times with the double Gloucester, twenty-four hours being allowed to intervene between each salting. The double Gloucester remains in the presses five days, and the single four, when they are put on a shelf or floor of the dairy, and turned twice in twenty-four hours. Gloucester cheese is distinguished for its smooth, close, and waxlike texture, and its very rich and mild flavour. If the curd is salted before being put into the hoops, the salt has the effect of giving a skin to the separate particles it comes in contact with, which prevents them from intimately uniting. It may be pressed together and be good cheese; but it never becomes a smooth, close mass, like that which is salted after it is made, being always liable to crumble when cut, a prevailing fault with American cheese.

The cheese called Stilton is principally made in Leicestershire, near Melton Mowbray, and the adjacent villages. It is a very rich cheese, rarely used for the table until two years old, when, by becoming partially decayed, blue, and moist, it acquires the particular flavour which causes it to be so highly

prized by the dealers. The following is the most simple process of making it. To the new milk of the cheese-making morning, add the cream of the milk of the preceding evening, together with the rennet. The separation of the curd must be carefully watched, and, when complete, it must be removed from the whey with as little breaking as possible, placed in a sieve, and remain there until it is of such a consistence as to bear being lifted up and put in a hoop without much pressure. The cheese, as it dries, will shrink. It must therefore be placed from time to time in a tighter hoop, and turned daily, until, by gradual drying, it acquires the proper consistence for keeping. By this process none of the cream is lost, and the curd, not being broken, remains more entire and uniform in its texture. It may not be amiss to remark, that, notwithstanding the high price of the real Stilton, and the estimation in which it is held, the taste for it is rather acquired than natural, few preferring it at first to the Gloucester or other first-rate cheese.

Formerly various substances were used to give colour to cheese, some of which were decidedly deleterious ; but all these have been superseded by annatto, which is not only perfectly innocent in itself, but produces a better colour than anything else. It is used in various ways. In some dairies it is dissolved in weak ley and kept bottled for use ; in others it is rubbed on a plate in the milk until sufficient is introduced ; of course, the quantity used will depend on the judgment or taste of the cheese-maker. If the cheese cracks, common red pepper added to the butter used for rubbing them, until it is very strongly impregnated, and applied to the defective places, will have a tendency to prevent flies and bugs from becoming mischievous and producing injury. Many dairies have within a few years introduced the practice of putting into their cheese a small quantity of saltpetre, which it is imagined renders it

more tender, while it does not detract from its flavour. We have doubts, however, whether the addition of any such ingredients has a real tendency to improve the products of the dairy, and in some instances they have proved positively injurious.

To make good cheese, it is desirable that the number of cows be sufficient to make a good-sized cheese every day. Where one is made by putting the curd of two days together, it is rarely of the best quality, as the curds are seldom in the same condition of temperature, fermentation, &c. From twelve to twenty cows will make a daily cheese sufficiently large.

Experience has shown that the best temperature for setting the cheese or applying the rennet is about that of new milk, or from 85° to 90°. The putting the milk of the night and morning together renders it necessary to heat a part, and this must be done until the temperature of the whole is at the proper point. A thermometer is therefore indispensable in a dairy.

Breaking up the curd is performed in different ways in different dairies. Some use a long wooden knife, which, drawn repeatedly through the mass at equal distances and crossways, divides the whole into small pieces or squares, allowing the whey to escape. Others pass their hand to the bottom of the curd, and, lifting it to the surface, break it up in this way, gently squeezing such pieces as remain too large. When broken up, some little time must be allowed for the curd to settle, as it is termed, or separate from the whey. Some use a gentle pressure of the hand to hasten the process and consolidate the curd; while others occasionally dash in a little hot whey, to make the mass more adhesive. This operation of taking off the whey must be performed gently, as well as the process of breaking up, or the whey will be white and thick, and a loss in the weight of the cheese will be the result.

The salt used about a cheese should be of the finest and best quality, and, though many directions have been given as to the quantity, there is no rule so certain as that of taste in making the application It should always be remembered, however, that too much salt will make the cheese hard, while too little will allow fermentation, and cause it to become light and to spread. At each turning of the cheese, fine salt must be rubbed on the outside, as it will harden that part and render it less liable to crack.

Many of our best dairies have within a few years adopted the practice of swathing their cheese as soon as taken from the press, or putting a strip of cotton cloth round them. This precaution, where the cheese is large and rich, seems indispenable, and operates most favourably in preventing spreading or cracks, and shutting out mites. The expense is trifling, and the results are of the best kind. What is considered an improvement on this has been made in some dairies. Instead of putting the bandage on after the cheese comes from the press, a cloth envelope, as large as the interior of the hoop, the bottom sewed in, and a similar piece for the top, is prepared, and the cheese is pressed into this instead of the ordinary cloths. At turning, the top piece is put on and pressed in, having been first attached to the other parts. In this way the form of the cheese is perfectly retained, cracks are wholly prevented, and all insects are excluded; while the butter rubbed on the surface acts as favourably as if the cloth were not present.

One of the best accounts of a cheese dairy, the process of making, and the amount of products to be found, may be seen on the 85th page of the fourth volume of the Cultivator, by Mr. Smeallie, of Princeton.

The number of cows was twenty. Cheese-making commenced on the 15th of May and ended on

the 12th of September. The amount of products was as follows:

20 calves, at $3 each	$60
400 lbs. butter, at 20 cents per lb.	80
500 lbs. do., at 28 "	140
2750 lbs. cheese, at 10½ "	288 75
112 lbs. whey butter, at 12½ "	14
2000 lbs. of pork, at 8½ "	170
Milk and cream for 18 persons	30
	$782 75
Deduct value of hogs and extra feed	60 00
	$722 75

The quantity of butter to each cow was about 47 lbs., of cheese 187 1-2 lbs., and the profits of each, without deducting expenses, $42 55.

CHAPTER XV.

BUTTER.

Various Qualities.— Churning.—Working.—Washing.— Salting.—Dutch Butter.—Packing.—Churning Milk.—Process.—Queries and Replies.

Every dealer in butter knows that the most decisive test which can be offered of the skill and neatness of the housewife or the dairy-woman, is furnished by the quality of the article offered by her in the market. If it is firm, rich, marrowy, and of proper consistence throughout; free from all specks and impurities; perfectly divested of the milk, and giving out that peculiar fragrance belonging to sweet and well-made butter, the seller may be set down as one that understands her business, and the produce

of her dairy will always command the first price in the market. On the contrary, if the butter be white, light, and porous; full of particles of dirt, flies' legs, cows' hairs, and other nameless abominations; without being freed from the milk, and abounding in particles of the curdled milk from which the cream was taken, then the character of the dairy for neatness may be marked as suspicious, and prices must be arranged accordingly. The colour of butter is no infallible test of goodness, though that which is moderately yellow, other things being equal, will generally be preferred; but, where the above-named qualities are present, whether the butter be white or yellow, its excellence may be relied on. The quality of butter, however, does not entirely depend on the skill or neatness of the maker: much must be allowed for the kind of pasture or other food allotted to the cows. For pasture, clean turf, mostly composed of white clover, and which has been laid down for a number of years, will be found sweeter and better than any other; and of the roots, carrots will make the best-coloured and best-flavoured butter. No cow, however, kept entirely on roots, will produce as good milk and butter as if fed partly on these and partly on fresh grass or hay.

Every dairy-woman is sensible that, to produce the greatest quantity and the best quality of cream, milk should be kept at a moderate temperature; and that the cream should be taken from the milk before the latter sours; since, if it is allowed to become thick, it is almost impossible to separate the curdled particles that will be skimmed off from the pure cream; and these, remaining in the butter, seriously injure its appearance, and render it unfit to keep. The goodness of the butter depends on the temperature of the cream while churning. This point, in most dairies, is not sufficiently attended to; or, if noticed at all, it is only with reference to the speedy formation of the butter. Cream grows warm from

churning, the rise of temperature being from four to six degrees, according to the time employed and the state of the cream; consequently, if the temperature is too high at the commencement of the operation, at the close it will be so much increased as to have a pernicious effect on the quality of the butter.

A few years since, by request of the Highland Agricultural Society of Scotland, a series of experiments was instituted by Mr. Ballantine, the owner of an extensive dairy, as to the proper temperature of cream for making butter, and the effects of different temperatures on the quantity and quality of the butter produced. Mr. Ballantine's report, which obtained the premium from the society, may be found in the "Library of Agricultural and Horticultural Knowledge," and is probably the best paper on the subject of making butter which has yet appeared. From Mr. B.'s experiments, it appears that the thermometrical range at which butter can be obtained extends from 45 to 75 degrees of Fahrenheit. A great number of experiments gave 60 degrees as the temperature at which the greatest quantity of butter could be produced from a given quantity of cream; and 55 degrees in the churn just before the butter comes as that which affords the best quality, giving a temperature of 51 to the cream at its introduction into the churn. Repeated churnings at this degree of heat "gave butter of the finest quality and colour, the milk being completely separated from the butter, which, when washed and made up into rolls, kept for a fortnight without acquiring either smell or taste." Mr. Ballantine says, "Butter intended to be sent to the market sweet, should be carefully gathered from the milk with the hand, and the milk squeezed out of it. It should then be put into cold spring-water, and, after being well washed, it should be made up into rolls with wooden flappers, and put into cold water to become firm;

but it should not be allowed to remain longer than is necessary to produce this effect, as the water will hurt both its colour and flavour." The practice of *washing butter*, as putting the newly-churned article into clear, cold water is called, has, we believe, never prevailed to any considerable extent in the dairies of this country; whereas, in England, the practice is almost universal. The time it should lie in the water must be determined by the season of the year and the state of the butter, an hour being generally considered sufficient; and after being, by washing and working, completely freed from the particles of milk and of water, it is salted according to the taste of the dairy-woman, and carefully put away for use or the market. Judge Buel condemns the use of water in the manufacture of butter, believing that it dissipates much of the fine flavour that gives to good butter its high value; yet in Orange county, where are the best butter-dairies in the state, and probably in the United States, it is a common remark among the dairy-women. "Give us cold, *hard* water, and we will not fail in making good butter." We do not think the washing of butter has been properly tested in this country, or, at least, the results have not been reported; and that dairyman who shall institute a series of experiments with regard to the making of butter in this and other ways, and the effect of washing on its qualities for table use and keeping, and faithfully record and report the same to some of our agricultural journals, will confer a great favour on a large portion of the community. Some experiments made on a small scale by Judge Buel certainly go far to prove the excellence of unwashed butter for keeping; and had he, at the same time, put down one or two pots of washed butter in the same way, it would have done much towards determining the course to be preferred in its preservation.

In salting butter, experience has shown that, if it

is intended to be kept any time, an ounce of good fine salt to a pound of butter is the proper proportion; but, where it is not intended to be kept, less may be used, according to the taste of the maker. Some persons have recommended, that to a pound of salt should be added four ounces of finely-pulverized loaf-sugar. We have tried this method, and found the butter admirable. Dr. Anderson says, "In Ireland (and few countries equal some parts of Ireland in the fine qualities of the butter) the use of salt and saltpetre is recommended, in the proportion of one ounce of fine rock salt and one fifth of an ounce of saltpetre to twenty-eight ounces of butter." None but the finest and purest salt should be used, as every extraneous matter injures its quality, and produces a corresponding effect on the butter.

Large quantities of butter are annually imported into England from Holland, and some from the same country has occasionally found its way into this. It is justly celebrated for its superior quality, and its power of resisting decomposition, or not being liable to become rancid. In the Dutch dairies everything is conducted with a system and neatness, from the feeding of the cows to the completion of the butter, worthy of all imitation and praise. That there is anything in the climate or pastures of Holland which renders their dairy products superior to those of the rest of Europe or to ours, is not to be supposed: the difference is clearly in the manipulation; and, were our butter and cheese in general made with as much skill and care as in Holland, we might successfully compete with the Dutch in the West Indies and other markets, to which our butter will now barely pay the cost of transportation. According to the report of Mr. Mitchell, made to the Highland Society of Scotland, the process in the Dutch dairies is substantially as follows: The milk, when taken from the cow, is poured into large earthen pitchers, and placed in a vat of cold water.

which quickly reduces the temperature. It is then placed on shelves until the cream separates, when it is taken off and put in vessels for churning. In these it is first allowed to become a little sour, and then the churn is half filled with the cream. In the best dairies, churning is performed daily, the system being so arranged that a supply of cream is constantly in readiness. In winter, a little warm water is added to the cream, to give to it the proper temperature previous to churning; and in very hot weather it is sometimes submitted to the cold bath to reduce the heat. When taken from the churn, the butter is put in a shallow vessel, and carefully washed with pure cold water, and then worked with a slight sprinkling of fine salt, whether intended for rolls or for barrelling. The butter is considered best when the cows have been at grass about three weeks: it is then delicious; is made into fanciful forms of animals, pyramids, &c., stuck over with fragrant flowers, and sells as high as sixty or seventy cents per pound. . When intended for packing, it is worked up twice or thrice a day with soft, fine salt, for three days, in a shallow tub, there being about two pounds of this salt used for fourteen pounds of butter. After this thorough preparatory working, it is hard packed in thin layers into casks made perfectly sweet and clean. The wood preferred is oak, smoothed carefully inside. Three or four days before they are used, the casks are filled with sour whey, and this stands until they are emptied and cleansed for the packing of the butter. It is clear, from this description, that, independent of the perfect neatness observed in every part of the process, the excellence of the Dutch butter, and the ease with which it is kept in its original sweetness when packed, is owing to the manner in which it is freed from the least particle of buttermilk by the first washing and the subsequent repeated workings, as well as to the perfect incorporation of the salt by the same process.

Where the butter is intended for family use, the best way we know of keeping it sweet is to put it down in stone crocks or jars which will hold from thirty to forty pounds. The butter should be packed close and solid, as directed for firkins, leaving a space of one or two inches at the mouth unfilled. Then make a strong brine, carefully boiling and skimming it, and with this fill the jar. Place the jars in a cool, sweet cellar; cover them carefully and securely to prevent any dirt getting in; examine them occasionally to see that the butter is covered with brine, and that the brine remains sweet and good. If a scum rises on the brine, turn it off and boil it, putting in salt if necessary, and skimming it until it is perfectly pure, when it may again be poured on the butter. Butter in this way has been kept nearly two years perfectly sweet and good; indeed, where coolness is desirable, nothing is better adapted to promote it than stone. A few years since, a friend of ours, for an experiment, filled a small firkin with butter in June, headed it up tight and threw it into his well, where it remained till November; and, when taken out, it was as sweet and fresh in taste as when put in. Perhaps, where the means exist of forming a vat in the dairy-house, and of throwing into it a stream of cold spring-water, this method of keeping butter might be advantageously adopted, as the water could not come in contact with the butter, while it would, at the same time, keep it cool and exclude the air.

Where the making of butter is the great object of the dairyman, it is necessary to understand *working the whole of the milk*, as in that way alone can the greatest quantity and best quality of butter be combined. The whole of the milk must be churned, or the whole of the butter will not be obtained. This process, we have reason to believe, is very imperfectly understood, and our object is to lay before our readers such practical information as may be neces-

sary to the successful prosecution of the business. To be able to do this effectually, we transmitted a series of queries connected with the making of butter from the milk to several who were engaged in the business, particularly to J. B. Gilbert, Esq., of Otsego county, whose success is undoubted, and the productions of whose dairy are considered first-rate in any market. These queries were kindly responded to, and the substance of Mr. Gilbert's paper we have imbodied in connexion with the questions submitted, with occasional notes.

Ques. 1st. In making butter from the milk, what churn do you use, and do you churn by hand or by machinery?

We use a dash churn of the size of a barrel, worked by machinery, the propelling power of which is a dog. We find this does the business promptly and effectually, it being desirable that the motion should be equal and sustained. Water, where convenient, might be used with success for turning the machinery.

Ques. 2d. Do you churn the milk new from the cows, or is it necessary it should be soured before the operation?

To produce the best butter and the greatest quantity, it is indispensably necessary that the milk should be soured. This is generally accomplished in warm weather without difficulty; but in cool weather, in the spring and fall, milk will stand so long before the cream rises or the milk sours, that the surface will become mouldy, the cream acquire a bitter and unpleasant taste, and the fine, rich flavour of the butter will of course be destroyed. To obviate this difficulty, we are in the habit, at such times, of setting our milk in pans which contain a small quantity of sour milk, a practice which greatly hastens the acidifying process. In extreme warm weather, milk will sometimes sour so soon as to prevent the proper separation of the cream; in this

case we find great benefit in adding to each pan of milk from a pint to a quart of cold water, according to the size of the vessel and the temperature of the weather; and, when it is very cold, we add about the same quantity of water, boiling hot, at the time of straining the milk. If the quantity of milk is so great that it is not convenient to churn the whole when soured, we set it in pans, and, when ready for churning, take off about one third of the whole by skimming. When we treat our milk in this way, we prefer not to have the pans more than half full. When we commence churning, if it froths, as it sometimes will when not sufficiently warm, we add boiling water to the cream until this disposition is checked. It is evident that cream grows warmer by churning, but what is the increase of temperature we have never ascertained. We cannot state precisely the average quantity of milk it will take to make a pound of butter, as experience shows us there is a very great difference in cows as to the quality of their milk, and also in the first and the last of the milk taken from the cow.

Quest. 3d. How many cows do you milk, and what is the average quantity of butter produced by them?

The average number of our cows in 1835 was thirty-five, and the butter sold was 4480 pounds, or about 130 lbs. to a cow. For this, in the fore part of November, we were offered $22 per cwt., delivered on the spot; but it had been previously contracted at a price somewhat less.

Quest. 4th. Have you ever practised washing your butter after churning it?

We do this invariably. After we have churned, and when the butter is sufficiently gathered, we put it into some suitable vessel, and wash it with pure, cold water until the milk is all out of it; we then salt it, working in the salt thoroughly, and set it in a cool place for 24 hours; after which it is well worked over with a ladle till fit for packing The

washing should be continued no longer than to free the butter from the milk; keeping it in the water for a length of time has a tendency to injure its flavour.*

Quest. 5*th.* What kind of salt do you prefer, and what is the average quantity used per pound of butter?

We prefer the Liverpool sack-salt to any with which we are acquainted, and use less than an ounce to the pound. When butter comes soft, it requires a greater quantity than in cool weather, as the salt in such a case will work out more. In no case, however, do we use an ounce to the pound of butter. We use no saltpetre.†

* Since receiving this communication from Mr. Gilbert, we have had the pleasure of a conversation with A. Wilkins, Esq., now a resident of Onondaga county, but formerly of Orange, and extensively engaged in the making of butter, who fully corroborates the opinions advanced by Mr Gilbert as to the advantage of washing butter when first churned. In the great butter-dairies of Orange, and they are exceeded by none in the United States, there exists scarcely a difference of opinion as to the absolute necessity of washing butter in order to produce an article of the first quality. Pure, cold, *hard* water is considered in the Orange county dairies a *sine qua non*, and the idea that such washing injures the flavour of the butter, as has been maintained by some, is viewed by them as quite ridiculous. In the Orange dairies, the practice of souring the milk is universally practised; and, in the language of Mr. Wilkins, "milk should in all cases become sour, and, if convenient, thick, before churning."

† We are convinced that the excellence of butter depends much on the quality of the salt used. In Western New-York, most of the butter is salted with the common Onondaga salt made by boiling, and which, though sufficiently pure for all ordinary purposes, is not entirely free from substances that are improper where perfect purity is required. It is, besides, too coarse in the grain to be adapted to salting butter; the finer the salt is for this purpose, the better, and it is this which renders the Liverpool sack salt preferable to ours. There can be no doubt that the Onondaga salt made by evaporation, and ground fine, any quantity of which may be readily obtained at Syracuse, and, we presume, in most of our villages, is fully equal for butter or cheese to the best imported salt, and we trust its use will soon

Quest. 6th. What is your method of packing and preparing butter for preservation or sale?

We pack our butter in firkins made of white-oak heart-stuff, well hooped with round walnut hoops, and holding about ninety pounds each. We soak them thoroughly in brine previous to using, and put in a trifle of saltpetre. The same brine, with a little renewing, will answer for soaking five or six firkins. When the butter has been worked sufficiently, we immediately pack it in a firkin as hard as possible, and the sooner the firkin is filled the better. As soon as the firkin is full, we put a clean white cloth over the butter, and cover the cloth with about three fourths of an inch of common fine salt, packed hard. The firkin is then covered with a thin, flat stone, which remains until the butter is taken to market. This method of packing, and keeping in a clean, cool cellar, we have found perfectly satisfactory.*

Quest. 7th. What cows do you prefer for the dairy?

So far as our experience extends, for butter we

become general. It may be remarked, that a less quantity of salt is used by Mr. Gilbert than by most dealers in the article, or than has been recommended by foreign writers on the subject of butter-making.

* The method of packing preferred by Mr. Gilbert, and in which he has been very successful, differs from the ordinary practice chiefly in covering the butter in the firkin with the cloth and the fine, closely-packed salt instead of brine. As the great object is to keep the butter cool and to exclude the air, either method, if well conducted, will be sufficient; but we think the chance would be in favour of the salt, especially when aided by the stone, a most efficient agent in reducing the temperature, and for that purpose far preferable to the head of the firkin or a piece of board. The heart of the oak is undoubtedly one of the best *unprepared* woods that can be used for firkins; but as all such woods contain more or less of the pyroligneous acid, which has a pernicious effect, as far as it extends, in decomposing the salt of the butter and imparting a disagreeable flavour, it is evident that the process of boiling the staves for a few hours, by which the acid would be extracted, would be a decided improvement in their manufacture.

should prefer select cows of the native breeds, although on this topic we are able to speak from little more than information, and the appearance of the few specimens of imported stock around us.*

* Mr. Gilbert admits that his acquaintance with the improved breeds of cattle is very limited, and possibly those that have fallen under his notice were not the kinds that produce the best milkers. He is not alone, however, in his opinion that cows may be selected from our native breeds preferable as milkers to a large majority of those imported. From our own information and observation, it would seem that the best and most abundant milkers of what is called our native breeds are tinged more or less with imported blood, principally the Devon, which has been more diffused through the country than any other. Certainly the best cows for milking which have fallen under our notice have been of this class, as was demonstrated by their fine skins and their rich red colour. A correspondent of the Genesee Farmer, who lives near Philadelphia, speaks of his dairy, which is somewhat select and extensive, as not averaging more than 100 lbs. to a cow. This he ascertained from a long series of recorded results. Mr. Gilbert's cows, which were not select, averaged 130 pounds for the season; and other instances have been given which reached from 160 to 190 lbs. A friend of ours, the last season, from a small dairy of six cows, sold 11 cwt. of cheese and 600 lbs. of butter, besides having an ample supply for his family. Few are aware of the difference in cows in the richness of their milk, and, consequently, in the amount of butter they will produce; hence, while some will reach 200 pounds in the season, or ten months, others will give scarcely one half that quantity. Of the few cows we milked the last season, we found from careful experiment that, while some would make their pound or more a day for a week, there were others which did not average more than eight or ten ounces. The profits of making butter from the milk of a dairy will therefore mainly depend on the goodness of the cows employed; and this point, while it is entirely overlooked by the great mass of dairymen, may easily be settled by actual and decisive experiment.

CHAPTER XVI.

THE DAIRY.

Its Profits.—Nature of the Expenses.—Products in Cheese or in Butter.—Comparative Profits.—Circular to Dairy-women.

THE first object of a farmer in cultivating the soil is profit; and next to this, the desire of securing his profits with as little expenditure of labour and means as possible. To do this, the quality of the soil, its condition, and the size of the farm must be taken into consideration. Its situation will in a great measure determine the first; its condition will of course depend on the judicious or injudicious treatment it has received; and as to number of acres, it is evident that, without a certain quantity of them, some kinds of farming, such as grain-raising or wool-growing, cannot be profitably undertaken. Perhaps there is no one branch of farming that can be so readily adapted to all farmers, great or small, as the dairy; and while it is clear that to raise grain extensively, a large farm is required, and much labour and money must be expended, a medium farm, one of eighty or a hundred acres, will be found best calculated for the dairy, as the hiring of assistants can usually be dispensed with in such cases. For a man with but forty acres to attempt the raising of grain for sale, and to keep, at the same time, the necessary horses, cows, and sheep for his farm and the supply of the family, would be an unprofitable undertaking; but on such a farm a dairy may be kept that will be a source of great profit when compared with the capital invested.

To have this matter clear, it will be best to make a few estimates, in all cases getting as near well-es-

tablished results as possible, and where anything must be left to conjecture, always being careful to err on the safe side of the calculation. A farmer wishes to commence a dairy with ten *good* cows, not herd-book stock, but good native animals. The price of cows for several years past, in the spring of the year, has varied from 18 to 22 dollars—we will call it 20—thus making the cost of his cows 200 dollars. For pasturing, it is generally estimated that two acres to each cow will be required; and it may be so, as pastures are generally laid down; but where the turf is clean and close, and the soil in good heart, we are confident something less will suffice to give them every advantage. The interest on the twenty acres required for six months, the time the dairy will be in operation, at 30 dollars per acre, will be 21 dollars. The interest on the money invested in cows will be seven dollars. A dairy-maid, if one is required, for six months, at a dollar per week, is twenty-six dollars. The expense, then, will stand thus:

10 cows, at $20 each	$200 00
Interest on do. six months . . .	7 00
Interest on two acres to each cow .	21 00
Dairy-maid six months . . .	26 00
Total expense	$254 00

If it be a cheese-dairy, much will depend, as to the receipts, on the quality of the milk and the skill shown in making. The quantity of cheese produced varies greatly in different dairies; and in estimating profits, a medium rate must be selected. Mr. Brown, of Otsego county, made from thirteen cows 4700 lbs. of cheese, or 361 lbs. to each cow. Mr. E. Perkins, of Trenton, Oneida county, from 78 cows made 32,000 lbs., or 410 lbs. to each cow; and in his communication he states that the dairies in that cheese-making region vary from 400 to 500 lbs. to a cow. Some experience in the dairy business, and familiar

acquaintance with a dairy district, lead us to suppose that 350 lbs. to a cow would not be an extravagant estimate. The average price of good cheese, when sufficiently ripe for sale, for several years past, has not been less than eight cents per lb.; and many dairies find their sales have averaged from $9 to $9 50 per cwt. Making our estimate at eight cents per lb., the receipts of a dairy of ten cows would stand as follows:

3500 lbs. cheese, 8 cents per lb. . .	$280 00
100 lbs. butter, 15 cents per lb. . .	15 00
Whey for swine, $2 per cow .	20 00
	$315 00

Making the receipts from each cow for six months $31 50; or, if we deduct the butter as being most of it necessary in the dairy-room, it will leave the sum of 30 dollars per cow. In some of the best dairy districts of New-England, it has been common to dispose of the cows to drovers after the dairy season has closed, but little feeding being generally required to make them good beef. Cows are not as high in the fall as in the spring by about 20 per cent.; and if our farmer determines to sell his cows in preference to keeping them over the winter, they will bring him about 160 dollars. This sum must be added to the receipts of the year, making a total of 475 dollars. The whole will then stand thus:

Receipts	$475 00
Expenses	254 00
	$221 00

Giving to the farmer a clear profit of eleven dollars upon each of the twenty acres used for the dairy. It must be remarked, however, that to produce this result, the cows must be in good heart and tolerable order on the first of May, and have good feed for the summer. Cows that "shrink" through the winter, and pasture on daisies, johnswort, and thistles

through the summer, will not reach the above mark; and the owners of such cows may think themselves fortunate if the summing up does not show a balance the other way.

If the dairy is devoted to making butter, there will be but little difference in the result; though, if carried under favourable circumstances, we think making butter rather more profitable than cheese. Many persons, however, connected with the dairy, think otherwise; and the difference, at any rate, cannot be very great. To make butter through the summer, the dairy must be so situated and constructed that a uniformly proper temperature may be maintained; as it is well known, if the temperature be too low, the cream will be so long in rising as to become bitter; and if too high, as is usually the case in summer, the milk sours before the cream has time to separate, by which much of the cream is lost, and the butter rendered of an inferior quality. In making butter, more is depending on the quality and richness of the milk than in making cheese, as some cows from the same quantity of milk will give double the amount of cream that others will; and hence the selection of animals must be made with reference to this point. The fact here mentioned accounts for the difference in the quantity of butter produced by different dairies, and the varying estimates consequently made of the quantity which each cow will produce in a season. There are some cows that, with good keeping, will make a pound of butter a day for seven or eight months; and there are others, that, if they give half a pound a day, may be considered as doing well.

The breed of cows has a great influence in determining the quantity and quality of the milk. The Earl of Chesterfield, a short time since, instituted a series of experiments with some favourite cows of different breeds, the results of which were as follows: " In the height of the season, the

	Qts. Milk.	Oz. Butter.
Holderness gave, per day	29	38½
Long Horn	19	25
Alderney	19	25
Devonshire	17	28
Ayrshire	20	34"

That there are few, if any cows of our native breeds that will approach this quantity of milk or butter, most must be willing to admit. Indeed, an able writer on cattle in the Farmer thinks that few cows in this country will average more than from 160 to 170 pounds a year. From some experiments we have ourselves made, and from the reports of a few ordinary dairies, we are disposed to dissent from this writer; and we believe that, with moderate care in the selection of cows and in the management of the dairy, 200 pounds may be easily reached. Mr. Curtis, of Marblehead, Essex county, Massachusetts, from common cows and ordinary pasture, for three years made butter as follows:

1828—8 cows	1272 lbs. butter
1829—7 "	1175 "
1830—6 "	1090 "

Which last is at the rate of 181 pounds to a cow, and that under unfavourable circumstances to make the most of the milk. We know cows that produce a pound a day for at least three months in the height of the season, and that without extra care or feed; still a native cow, to do this, must be good. For three years past, butter, taking the whole season, has averaged 15 cents per lb.; and, calling the amount produced from a cow 200 lbs., the balance will stand thus:

Butter from 10 cows, 2000 lbs.	$300 00
Skimmed milk, $3 per cow	30 00
	$330 00

Making a difference of fifteen dollars in favour of butter over cheese-making. Where the milk is

churned fresh from the cows, the quantity of butter will of course be greater; but we have never made it in that way, and have no authentic information by which the difference, and, of course, the profits, can be correctly estimated.

Various estimates have been made of the expense of getting in a crop of wheat or corn; but, where wheat is put in after a summer fallow, as is usually the case, the expense of ploughing, harrowing, seed, interest, wear of implements and land, cannot be estimated at less than ten dollars per acre. Admitting the average crop of wheat to be twenty bushels per acre, which must, taking the whole, be considered liberal, and a profit of ten dollars per acre, wheat at one dollar per bushel, which may be considered the average price, will be the result. It would be easy to make out a list of the items of expense and profit, but there can be no necessity for it here, as every wheat-grower can make the calculation for himself, if he needs to be convinced that the above estimate is not far from the truth. If the crop to be compared is corn, estimates made with great care by Judge Buel, by Clark, and others, show that in ordinary cases the expense of a crop, including labour, seed, use of land, &c., is at least fifteen dollars per acre. The profits of a corn-crop are more variable in our latitude than most others, sometimes running very high, and at others being literally nothing; and we believe that, if the average estimate of profit on an acre of corn is put the same as wheat, it is as high as the experience of the farming community will justify.

If the above calculations are correct, then the difference in profit per acre between the dairyman and the wheat-grower is not so much in favour of the latter as has been generally supposed. It may, however, be said, that the practice of disposing of his cows by the dairyman after the season is closed, would in the end be suicidal to the business if gen-

erally adopted; and hence, as a general rule, the cows must be kept over the winter, making it necessary to deduct from the profits the expense of keeping during this period. The result would then be as follows: A cow will eat a ton and a half of hay during the winter, which, at the average price of eight dollars a ton, would be twelve dollars for keeping; rather exceeding, if there is any difference, the neat profit on each cow the first season. It must be remembered, however, that if the produce of a good cow will pay for herself and her winter's keeping the first season, then the dairyman enters the field the second year with an unencumbered capital: the cows are paid for, and the entire amount of the produce, with the trifling deductions above stated, are to be counted as profit. Let our dairy counties look at this matter carefully; it is well worth their attention.

[We add the following, as coming from extensive and experienced dealers in the products of the dairy; and have no doubt attention to its suggestions would add much to the quality and character of the products of the American dairy.]

TO THE DAIRY-WOMEN OF OUR COUNTRY.

The undersigned, dealers in butter and cheese, would call the attention of the manufacturers of these articles in the middle and western parts of this state, to the existence of general and just complaints in regard to the quality and condition of both butter and cheese made in such sections, together with the packages. In view of this fact, and to encourage an improvement that will restore and increase the reputation formerly enjoyed by producers of these articles, they would respectfully submit to their consideration the following views, relative first to the manufacture of cheese: In all cases, the milk

and rennet should be perfectly sweet; as much of the animal heat should be evaporated from the milk as time will admit; when the curd is properly produced, break it up very fine, cook it well, but do not heat it so much as to start the oil in the curd; season it with clean, fine salt, pure from lime; put the cheese in the press cool; press it hard, in order to extract all the whey from the middle before the outside closes tight; continue to press for two days; from the press put a dry cloth over it for a few hours, until a rind is formed; then put on annatto, dissolved in strong ley; cover again with the cloth until the next day; after the cloth is removed, put on a thick, strong coat of melted beeswax and lard, or butter; get a bright, smooth surface, and keep it so, by constant rubbing and turning, until the cheese is perfectly cured. When put in the casks, let it always be done in cool, dry weather. All cheese should be slightly coloured with annatto in the milk; and such as do not exceed fifty pounds in weight should be made a bright orange colour; cheese of this description being generally in good demand for the Southern markets. Finally, there should never be any late cheese. In no case should cheese be sent to market made after the 15th day of September; nor should it be sent even thus late, unless the utmost pains is taken with it, and unless it is well cured by a fire. It is of the greatest importance to the dairy interest that these rules, in regard to late cheese, be strictly conformed to; for this kind of cheese not only destroys itself and greatly injures the market for a good article at the present time, but, should the practice of making and sending it be persisted in, it will eventually destroy the business. To prevent any loss to the farmer, the undersigned would advise them to make butter after the 15th of September; butter made after this time always commanding a fair price.

2d. *Of Cheese-casks.*—They should be smoothly

and well made of good seasoned wood, not less than half an inch in thickness for small casks, and five eighths of an inch for large casks: the heads of all large casks should be at least five eighths of an inch in thickness, to prevent them from springing; the staves should be narrow, in order to preserve their places and keep the cask round; there should be always a fair bilge, with at least eight good substantial hoops (maple hoops should never be used); the quarter hoops should never be put down so low on the casks as to allow the staves to spring out when the head hoops are taken off; the other hoops should all be securely nailed.

3d. *Of Butter.*—In all cases where it is made from cream, it should be churned before the delicious flavour is lost, or any bad flavour induced; avoid too much heat in the process, as this causes the butter to be soft and of fine grain, bordering on a waxy character; never fail to extract every particle of milk before it is laid down; season it with rectified fine salt, or ground solar salt, and work in no more of it than will be entirely dissolved: where any of it is left undissolved, it destroys that delicate rosy flavour which renders the article most desirable, and its value diminishes in proportion to the excess of salt—this being one of the greatest objections to Western butter.

4th. *Of the Packages.*—The undersigned would recommend two kinds, viz., firkins and Welsh tubs. The firkins should be made of seasoned white oak, with walnut hoops. Where white oak is not to be had, they should be made of heart-stuff of white ash, and hoops of white or black ash or elm, of good shape and perfectly smooth; have on at least ten good hoops, smoothly shaved; let them be perfectly tight, and contain 100 lbs. Welsh tubs should be made of seasoned white ash, hooped with seven substantial split ash hoops, smoothly shaved, to contain from 100 to 120 lbs. Both firkins and tubs should

be soaked in a strong pickle, in order to saturate the wood before the butter is laid down; but never put any salt at the bottom or on the top of the butter. Great care should be taken to put it down solid; never fill the packages so full as to have the head or cover touch the butter, and always make a smooth surface on the top with the ladle. The tubs and firkins should be weighed, and the actual dry weight marked upon them with a marking iron in such a manner as not to be obliterated; and let them always be found accurate.

In conclusion, the undersigned give it as their decided opinion, that the manufacturers of cheese and butter in the middle and western parts of this state, who will observe the above rules, and unite with the observance a desire to make their articles of the first quality, after a little experience, will be able to compete with any part of the United States, both in quality and prices, at home or abroad. Possessing, as these manufacturers undoubtedly do, one of the finest soils, and the best adapted to grazing of any in our country, they may produce the article in the greatest perfection. On this, as well as other accounts, the undersigned wish to impress upon their minds the importance of this subject, and that the course recommended is the only one which will secure to them the advantages of a fair price and a good reputation for their labour and pains.

Signed, Leggett & Lapham, and others.

New-York, April, 1838.

CHAPTER XVII.

THE KITCHEN OR FARMER'S GARDEN.

Importance of a Good Garden.—Proper Soil.—Preparation.—Sowing Seed.—Depredators.—Qualities and Germination of Seed.—Degrees of Hardiness.

THERE is very little danger of the importance of the garden to the farmer being overrated, or of the directions for forming and cultivating one being too ample and minute. The farmer who manages his garden well not only finds it a source of great personal comfort and emolument, but it proves to him an experimental farm in miniature, in which the various modes of cultivation; the effect of the several kinds of manures; the changes which continued cropping with one kind of plant, or a rotation of plants produces on the soil, and their respective quality, productiveness, and consequent value can be determined with accuracy. A neat and well-arranged garden may be generally considered a very good index to the state of the farm; for rarely, indeed, is a man found who manages and cultivates his garden thoroughly, that will be inattentive and slovenly in the culture of his field-crops. On the contrary, in most cases where the garden is neglected, the farm will be found in a corresponding condition, with more weeds than valuable plants, and indicating that the labour expended will receive a very inadequate reward.

There is among farmers generally a too prevalent idea that the work done in the garden is lost to the farm. Such is not the fact; and it would not be difficult to show that the acre in garden, well cultivated, and stocked with a proper variety of vegeta-

bles, yields a far greater amount of actual profit, even if not the worth of a single dollar should go to the market from it, than any other acre of the farm. The quantity of food used either by man or beast, and contributing essentially to the comfort as well as the positive subsistence of a family, is very great; but, as it is consumed daily, its value is little realized, except by those who are compelled to purchase in the market what the farmer, or most individuals in the country, may produce in their garden. It is to aid in the cultivation of the common garden, such as every farmer, mechanic, or professional man out of our cities and villages may have, that the following directions are principally intended. The professed gardener has his works devoted expressly to this pursuit; most of them too bulky and expensive for common use, and containing a mass of directions not applicable to ordinary garden-culture at all, or not without an expenditure which few are willing or able to encounter, and embracing a multitude of plants or vegetables cultivated more as articles of luxury or curiosity than as being of any actual value. In arranging these directions and descriptions, reference has been had to the works of Loudon, Smith, Bridgeman, the articles on Gardening in the Encyclopædias, and many valuable hints have been derived from the numerous agricultural and gardening journals of our country.

The most essential requisite to a good garden is a good soil; one adapted to the vegetables intended for cultivation, and by its original composition or artificial management brought into a state the best calculated to ensure productiveness and increase fertility. The best soils for gardens are those in which the several original earths of sand, clay, and lime are so proportioned and balanced that they may be worked easily, and will not be liable to suffer either from drought or the accumulation of water. Such a soil usually approaches the nature of deep, strong

loam, and by proper management can have any degree of depth or fertility given it. If the soil is very light, sandy, or gravelly to a considerable depth, it will be too porous, subject to drought and to infiltration, or the sinking of the most valuable and efficacious parts of manures so far into the earth as to be below, and, consequently, lost to the plants. On the contrary, if the soil contains too much clay, it will be close and tenacious, retentive of moisture, and while it will be hard and solid when dry, it will be sticky and like mud when wet. A clay soil, or one too retentive of moisture, is more difficult to manage than one which fails the other way; but either can, by proper care and skill (the first or porous soil by the application of retentive materials, such as clay-marl or common clay, and the last by deep and thorough digging and draining, and perhaps the application of a quantity of sand), be made suitable for most plants. A soil naturally favourable is, however, always to be preferred, as in this case the simple incorporation of manures to the proper depth is all that is required to fit it for the reception of seed and the growth of vegetables. Inattention to the soil is a fundamental error in commencing a garden, and many failures have occurred from a want of care in this respect.

But, however well constituted the soil may naturally be, to produce many of the vegetables grown in the garden, or, indeed, any of them in perfection, it must be brought into a rich state by the liberal application of manures. These, for the garden, should be fine, free from the seed of all weeds, and easily incorporated with the earth. In the country we not unfrequently see manure fresh from the stables, full of seed, straw, or hay, applied to gardens without any previous preparation; thus, at the same time, greatly increasing the labour of cultivation, and materially diminishing the quantity and value of the product. None but thoroughly-rotted manures or

compost should be used on the garden; and a neglect of this rule will subject the cultivator to much inconvenience and loss. The best compost is made of successive layers of stable manure and vegetable mould, such as old turf or muck from swamps; the earths absorbing and retaining the gases from the fermenting dung, and thus aiding the decomposition of the vegetable or fibrous matter existing in the mould. Where convenient, the compost heap will be much increased in value by keeping it under cover, and by turning and mixing the ingredients once or twice after the active fermentation has ceased. We have tried, and seen tried by others, a mode of preparing compost, which appeared in a considerable degree to unite excellence of compost and profit in its formation. In one part of the garden let a trench five or six feet in width, and from twelve to eighteen inches in depth, be made, into which, as early in the spring as may be practicable, stable or long manure is to be placed, forming a kind of mound or ridge, the central part of which may be some three or four feet in height from the bottom. Over this the earth removed from the trench is to be thrown, and enough added to make a covering of ten or twelve inches in thickness, on which, at the proper season, some of those plants that require or will bear such a position (pumpkins, squashes, or even cucumbers and melons may be so grown) may be planted; and the decomposition, while going on, produces heat sufficient to give the greatest luxuriance to the vegetables, while the manure is at the same time preparing for application the coming season.

The time of preparing the soil for the reception of the seed must of course depend much on the circumstances of quality and exposure, but more on that of climate, influenced as this must in a great measure be by geographical position. Thus, while green pease are plentiful in the market at Charleston, they are blossoming at Norfolk, in early, vigor-

ous growth at New-York, and just sown at Montreal and Quebec. The fact, therefore, of geographical position must always be considered in the culture of plants, time of sowing, &c.; and that of elevation should not be overlooked, as it is well known that the difference in temperature between a valley and a mountain-range or elevated land, at not more than three or four miles' distance, is not unfrequently equal to that of as many degrees of latitude. It is always desirable to have the seed of vegetables as early in the ground as is consistent with the safety of the plants, as the earth in the spring contains the moisture essential to perfect germination, and as soon as the ground has received the proper degree of heat, then is the time to plant. Some seed will germinate with a much less degree of heat than others; and those that are most hardy are usually of this class. Thus lettuce and pease will vegetate at a temperature in which the seed of melons, and even corn, would most certainly rot. As a general rule, then, applicable to all parts of the country, it may be said that all seed should be put in the earth as soon as its temperature will admit of germination, and the young plants be secure from the spring frosts. The preparation of the ground for a garden requires few directions; if properly constituted, and sufficiently rich or well manured, nothing is necessary but turning it up with the spade or the plough, making the surface fine for the reception of the seed, and giving a depth of loose, friable earth, of not less than eighteen inches, for the roots of the plants to penetrate and seek their food in. A good depth of rich soil is favourable to all plants, and indispensable to some.

In laying out and planting a garden for vegetable culture, reference will usually be had more to utility and convenience than to mere appearance; but even the arrangement of the kitchen garden may be made to display correct taste, and the exemplification of habits of order and neatness is rarely more conspic

uous or deficient than in this place. The allotment of the ground must be made so as to give the proper proportion to each variety of plant; and the situation of each must be arranged so as to secure the benefit of air, light, &c., without which perfection cannot be expected. Reference must also be had, in planting the garden one year, to its probable cultivation the next, so as to secure a rotation of plants, and not have the same variety occupy the same ground for successive years, where it can be avoided. Beds or squares are found the most convenient disposition of the surface, as they may be constructed with regularity, and the divisions between them will give easy access to the whole.

The operation of putting in the seed is usually and best performed by the hand. Some few of them may be planted by the drill sufficiently well, but, as a whole, the hand is preferable. Many of the seeds planted are very small, and such, if planted deep, will not germinate; and if left with the earth loose about them, they will also fail. The depth to which ordinary garden seed should be planted can be much better gauged, and the operation of covering more effectually performed by the hand than in any other way. If the ground is made sufficiently fine, what some gardeners call a hand drill, or a kind of rake, may be used with advantage for making the furrows in which the seed is to be deposited. It consists of a rake-head, longer or shorter as required, into which teeth wide at the head and tapering to the point are inserted, at the distance required for the rows of the vegetable to be sown. A handle, inserted in the usual way, completes the implement. Two or three of them may be necessary, as some plants demand, in growing, a greater distance between the rows than others, and the teeth of the rake or drill must correspond to the required distance. When the ground is fine and in good order for seed, such a drill, drawn across a bed or plat to

be sown, will make as many furrows as it has teeth; and if the first furrow is made accurate by a line or a straight-edged board, the succeeding ones will be so too, since a tooth may be allowed to run in the last-made furrow in drawing the drill across the bed. After the seed is deposited and covered, a roller should be passed over the furrows, to press the earth closely about the seed and ensure germination. All garden ground, when planted, should be rolled, as a smooth, level surface is one of the best preventives against insects, cutting off many of their hiding places, or exposing them more readily to capture.

Nearly all cultivated vegetables have their peculiar depredators among the insect tribes, and all gardens are more or less infested with some of them. The cut-worm feeds on beans and cabbages, or seems to prefer such plants to most others. The surest way of eradicating these is to examine the parts of the garden allotted to such plants early in the morning, and, where a plant is cut down, the depredator may be found either immediately by it, or within a few inches of it, and destroyed. A good dressing of lime incorporated with the surface, besides benefiting the soil, will have the effect of destroying many of the worms and small bugs, and the eggs of such insects when near the surface. The yellow bug so destructive at times to cucumbers, squashes, melons, &c., can only be effectually prevented from preying on these plants by hunting them out and killing them. A squeeze between the thumb and finger is the most certain method of arresting their career. The cabbage is liable to the attacks of a small fly or bug, which, when they are young, inflict great injury upon them. As they collect on single plants, by paying attention to these, and destroying as many of them as possible around such plants, and by frequently hoeing the plants to aid their growth, much of the loss that would otherwise be incurred may be prevented. A caterpillar

appears by thousands, at times, on cabbages and turnips, and we have sometimes noticed them on beets; but as these are the product of the eggs of a moth, and, when young, are confined to a single leaf, the gardener who begins with them in season will have little difficulty in exterminating them, by picking all such leaves before the myriad brood is scattered, and crushing the whole at once with the foot. The same mode of extermination is also the best that can be pursued with regard to the aphis, or green plant-louse, that depredates so extensively on most cultivated plants. The singular manner in which the young of this insect is produced, gives a rapidity of multiplication unknown to other insect tribes, and enables a single female, when impregnated, to become in a few days the parent of millions. When a colony is observed on the turnip or cabbage, or other plants, they should be exterminated at once, or they will spread with astonishing rapidity. One of the most effectual aids of the gardener in the destruction of insects is a brood of chickens. A hen with a dozen or twenty chickens, placed in a portable coop, and the chickens allowed to run at large, will destroy more bugs, cut-worms, slugs, snails, earthworms, and moths, than the most active and skilful man; and, while young, and their services the most valuable, they will meddle with or injure no plant. All the care requisite is the occasional feeding of them with the hen. The multitudes of small birds which abound where they are undisturbed also destroy thousands of these insect depredators; and the disposition which unthinking boys or brutalized men show to kill or maim these beautiful residents of our groves or orchards, should meet with the severest reprehension.

When insects are, however, very numerous, it may be desirable to use some other measures of prevention or destruction, and a powder made of soot, ashes, and charcoal, dusted over the plants,

will sometimes be of great service. Too much soot on very tender plants must be avoided, as it will prove fatal at times if used too liberally; no such danger results from the charcoal dust or ashes. A decoction of waste tobacco, dung, soot, burdock, or elder leaves, or other materials offensive to insects, in water, and applied with the watering-pot, will aid in driving them away or destroying them; and if an occasional watering of soapsuds, or of a solution of saltpetre be given, the benefit will be great, and the growth of the plants materially assisted.

Much of the success of the gardener depends on the quality of his seed, and too much care cannot be given to this point. There is a constant tendency in all varieties of the same plant or species to intermix, or, as it is termed in breeding cattle, to cross with each other; and hence, unless great care is taken in the growing of seed, their product may not be like the original or desired variety. The value of the watermelons cultivated for the New-York and Philadelphia markets has greatly decreased, in consequence of the general growth by the market-gardeners of the citron melon for preserving; the varieties having intermixed to such a degree, that the flavour of the melon has suffered materially, and its rind been thickened in the same proportion. The beet is another plant very liable to have its value impaired by impregnation with inferior kinds; and many who purchase the scarcity or the sugar-beet, find the product of their seed to be some variety of the common beet, or a mixture of that with the required sort. Cucumbers, squashes, carrots, corn, and many other vegetables deteriorate for the same reason; and those who grow seed for the market, or for themselves only, should be aware of these facts, and plant the roots intended for seed at such distances from other varieties of the same plant as to preclude all intermixture.

The facility of germination in seed, and the val-

ue of the plants it produces, are much influenced by its age. There are some kinds which cannot be kept beyond the second or third year with safety, as they will either not germinate at all, or so tardily as to give weak and worthless plants. Light, thin seed, such as rhubarb, parsnip, &c., should be only one year old. The carrot, pepper, pease, beans, onion, cress, nasturtium, &c., will be good when two years old. Lettuce, parsley, spinage, artichoke, mustard, &c., will vegetate freely at three years. Cabbage, celery, radish, and turnip seed may be used when four years old; and cucumber, melon, squash, beet, pumpkin, and burnet seed will grow when kept five or six years; though in nearly every case, the fresher the seed the better. Owing to neglect of this order of nature, seed is put into the garden that never vegetates; and even seedsmen, it is to be feared, are so forgetful of these facts, that seed past its prime for vegetation is often sold to farmers and others, to their great injury.

The following table we copy from Bridgeman's "Young Gardeners' Assistant," a work that we can cordially recommend to all engaged in gardening.

At 1 foot	distance, an acre	will contain	43,560	plants
1½	"	"	19,360	"
2	"	"	10,890	"
2½	"	"	6,969	"
3	"	"	4,849	"
4	"	"	2,722	"
5	"	"	1,742	"
6	"	"	1,210	"
9	"	"	537	"
12	"	"	362	"
15	"	"	198	"
18	"	"	134	"
23	"	"	98	"
24	"	"	75	"
27	"	"	59	"
30	"	"	48	"

This table may be useful in various ways, not only to the gardener in determining the plants he

can put on an acre at the several distances named, but in planting trees it shows the number that will be required when the distance is once fixed upon, and in farming, the number of hills of corn per acre, and the proper division of a given quantity of manure on a certain number of acres, so that each part shall be equally benefited.

For convenience' sake, writers have divided the commonly cultivated garden plants, so far as it regards their ability to endure a low temperature, into *Hardy*, *Half Hardy*, *and Tender*.

Hardy.	Half Hardy.	Tender.
Asparagus.	Artichoke.	Beans, Kidney and Pole.
English Dwarf Beans.	Beet.	Cucumber.
Leek.	Cabbage.	Egg plant.
Onion.	Cauliflower.	Indian Corn.
Parsley.	Carrot.	Melon.
Parsnip.	Celery.	Okra.
Pease.	Cress.	Peppers.
Salsipy.	Lettuce.	Squash and Pumpkin.
Spinage.	Radish.	Tomato.
Corn Salad.	Turnip.	Herbs in general.

As plants cultivated in gardens are intended for food at different stages of maturity, some while in the bud, as asparagus; others while green, as salads, sweet corn, and summer squash; and others in a ripe state, as the melon, potato, and tomato, reference must be had to these things in the division and appropriation of a garden; but, in all cases, plants intended for seed must be allowed fully to ripen, and their seed to perfect itself, or it will be comparatively worthless. Imperfect or impure seed may indeed germinate, but inferior, sickly plants will be produced.

As these notices of gardening are intended for the use of those who cultivate plants or vegetables for their own use rather than for those who make gardening a profession, and who, of course, will avail themselves of more ample and comprehensive treatises, it may not be amiss here to state, that only

those plants will be described, and their mode of culture given, that are necessary in any good garden, be it owned by farmer or mechanic, and which vegetables may be grown in nearly all parts of our country in the open air, without the aid of artificial appliances. There can be no propriety in encumbering our pages with descriptions of vegetables or plants which not one in ten thousand of our gardeners cultivate, or find of any value, and of which people generally have perhaps never heard.

The vegetables described have been classed alphabetically, as being more convenient to the reader. Some of the herbs most prized for cooking or for their medical virtues have been introduced in their proper places, and will doubtless be found of service when cultivated in the kitchen-garden. The most simple, and, at the same time, effectual methods of growing vegetables will be described, as being best adapted to the generality of readers. The scientific or botanical name will be added to the common one, as distinguishing the plants more definitely, very different plants in different parts of the country being known by the same name.

ARTICHOKE.

The two plants grown under the name of artichoke in gardens are very different in their nature, modes of cultivation, and uses. The first is grown for its large flower-heads, the last for its tubers, which, like the potato, are matured in the earth. Of the first kind, the *Cynara*, there are two varieties, *Cynara Scolymus* and *Cynara Hortensis*, or Globe Artichoke; which latter is preferred for general culture, as producing larger heads than the other.

The artichoke may be propagated by seed sown in beds of rich, fine earth, or by suckers or offshoots from old plants in the spring; and a plantation of them, if well cultivated, will continue to produce good heads from seven to ten years. The flower-

heads, in a green or immature state, contain the fleshy part used, technically called the *bottom*, and which is prepared for cooking by being freed from the scales and seed-down. Boiled from an hour and a half to two hours, and served up with melted butter and such condiments as may please the palate, they constitute a delicious dish, and may be had in perfection from July to October.

Artichokes require a rich, deep soil, and, before they are planted out, the ground allotted them must be made so by trenching and manuring. The young plants or suckers are set in the earth in rows about four feet apart, and two feet from each other in the rows. Two or three plants or suckers, and by some gardeners even more, are placed at each point of setting.

These beds require to be dug and manured with thoroughly rotted manure every spring, a fork being used for loosening the earth; and they must be kept free from weeds at all times. The crowns of the plants require protection during the severity of the winter, and horse-litter, light dung, leaves of trees, or other similar matters, will serve to secure them against the frost. Early in the spring the covering must be removed, the beds levelled and dug over, the earth loosened around the plants, and, where they begin to spring up, the shoots must be removed, with the exception of three or four of the most thrifty on each stool. "The maturity of a full-grown artichoke is apparent by the opening of the scales; and it should always be cut off before the flower appears in the centre; the stem should be cut close to the ground at the same time." This vegetable is a native of the south of Europe, and has been extensively spread over many countries for culinary purposes.

The Jerusalem Artichoke, *Helianthus Tuberosus*, known to most as the common artichoke of the garden, is, like the potato, a native of America, and the

roots or tubers are held in great esteem by many, sliced thin and eaten with vinegar and pepper, or boiled and mashed to be eaten with butter. Few roots are propagated more easily, either by cuttings or whole tubers; and, when once introduced in a soil, the eradication is somewhat difficult, as the least piece containing an eye (and these are very numerous) is sure to sprout. When intended for the table they should be planted in a good soil, but not freshly manured (as the roots in that case are apt to be wormy), and hoed so as to keep the earth loose and clean around them. If allowed to remain in the ground through the winter, the roots will have a crispness and richness not found in those preserved in any other way. The cultivation of the Jerusalem Artichoke for swine has been strongly recommended by some eminent farmers, and great crops have been occasionally raised. It is not probable, however, that in ordinary cases it could be made to supersede the potato, or that the yield of the artichoke would equal that of the latter root.

ASPARAGUS. *Asparagus Officinalis.*

Asparagus is one of the most esteemed of garden vegetables, and can be cultivated readily in most situations, where the ground has been properly fitted for its reception. There are several varieties, differing little except in the size of the buds or shoots, and all requiring the same mode of cultivation. It is idle to attempt the culture of this plant unless the earth is rich and deep, and, to ensure this, gardeners recommend that it be dug over and thoroughly incorporated with manure to the depth of two or three feet. A soil moderately light, in which the roots can spread freely, will be found best for this plant; and, when once prepared, its fertility must be kept up by forking in, either in the fall or early in the spring, three or four inches of well-rotted manure. Asparagus-beds should have the full light and

warmth of the sun, as the buds will not only start earlier, but will be larger and finer.

The seed may be sown as soon as ripe in autumn, or as early as a bed can be fitted for it in the spring, the soil being of the finest, richest kind, and the seed being put in in rows a foot apart and lightly covered. They will be fit for transplanting the first year if well cultivated, although some prefer letting them remain in the seed-beds till the second year.

An asparagus bed may be made by preparing the ground as described above, and allowing four feet for four rows of plants, with alleys two and a half feet between every four such rows. The young plants must be placed in trenches six or eight inches deep, twelve inches apart in the rows, the crown of the plants being left two or three inches below the surface, and the whole raked over smooth and even after planting. These beds may be made in autumn, after the plants have ceased to grow; or in the spring, before the buds have commenced growing, so as not to be liable to injury from removal. If large quantities are intended to be grown, the ground must be prepared by repeated deep ploughings and manurings, the rows planted four feet apart, and, when the asparagus season is past, the intervals between the rows may be ploughed and planted with any vegetables that will mature after that period. Turnips, cabbages, and potatoes are grown in this way, thus securing a double crop from the same land.

When the stems of the asparagus show, by their turning yellow, that they have finished their growth, they should be cut close and carried from the beds, which should at all times be kept perfectly free from weeds. If the bed is then covered with leaves, horse-litter, or other material that can be readily removed in the spring or incorporated with the soil, the plants will be benefited during the winter, and earlier buds will be produced than could otherwise be grown.

The quantity of this vegetable grown for the London markets is astonishing. Loudon says, that "one grower alone has eighty acres," and there are others who are but a little below in the scale of production. The buds should be cut with a slanting stroke two inches below the surface, and should not be kept any considerable time after gathering before it is cooked. In cooking, boil it in water, seasoned with salt, till it is tender, which will be from twenty to thirty minutes, when it may be served up on toasted bread with melted butter, or in such other way as may be preferred. It is both healthy and nutritious.

BEANS.

Cultivated beans are of two kinds, *Vicia Faba* and *Phaseolus Vulgaris.* To the first class belongs the English bean, embracing a dozen or more varieties, of which the early Mazagan, Windsor, Genoa, Non pareil, and the Long-pod bean are the most celebrated. In the British Isles, the culture of the bean, not only in the garden, but in the field, is an object of great interest, being used extensively in the feeding of animals. The English beans have not succeeded well in this country, owing, probably, to the greater intensity of our summer heats; and hence, when cultivated, they should be planted as early as possible. In England they are planted from October to April for early crops; and from that time to July for fall crops. Of the kinds named, the Mazagan is the earliest, the Long-pod the best bearer, and the Nonpareil and Windsor the best for culinary purposes. In the Western, Middle, and Eastern states, if some of the best varieties of these English Dwarfs are planted out as early as the ground can be fitted, they will produce tolerably well, as they are not apt to be injured by the frost: in the South, they may be planted in succession during the fall and winter months, thus securing an early crop for the coming season. These beans must be boiled in

plenty of water, with a little salt; and, if a few stalks of mint are added, the flavour is improved. They are served up with melted butter. For table use they must be gathered young.

The *Phaseolus* includes the Kidney Dwarf (our common bush-bean), and the Pole or Running bean, well known to our gardeners. The Dwarf bean is a native of the East; the Runners originated in South America. There are some fifteen or twenty varieties of the Dwarf or Snaps in cultivation; of these, the early Six-weeks, early China Dwarf, white Kidney, red Cranberry, and Refugee or Thousand-to-One, are the best. No variety of the *Phaseolus*, either dwarf or pole, must be planted until all danger from frost is over, as, being natives of warm climates, cold is destructive to them; and they should not be hazarded in the open ground till the proper temperature is gained. "It should be recollected," says Mr. Bridgeman, in his excellent treatise, "that these beans are next to melons and cucumbers for tenderness, and will always grow quicker and yield better if the planting is delayed until settled warm weather."

Of the Pole or Running varieties, some ten or twelve kinds are cultivated; and of these the red and white Cranberry, the Caseknife, the London Horticultural, and the Princess or Dutch Caseknife, are the best; but, of all beans, the Lima, *Phaseolus Limensis*, is perhaps the best.

The cultivation of the bean is very simple. A good soil is required, but all new or unfermented manures should be avoided, as causing more vines than pods. Bush-beans may be planted in rows, two and a half or three feet apart, and about three inches distant in the rows; while pole-beans should be planted in hills, four feet apart each way, with not more than four stalks in a hill. Nearly all these varieties of beans are productive, and some of them continue in bearing until cold weather. The dwarfs

are cultivated in the field, and frequently prove a profitable crop. For field-culture, the white China Dwarf is generally preferred, being a prolific bearer, and commanding a good price in the markets. The great enemy the bean has to encounter is the cut-worm, whose ravages may be checked or prevented by a frequent examination of the hills or rows, and killing the depredators, which are usually found concealed in the earth around the plant.

BEET. *Beta Vulgaris.*

There are many varieties of this plant, of which the most important are the early Blood Turnip-rooted, Long Blood, early Scarcity, Mangold-wurzel, and Siberian or Sugar-Beet. The last two are used principally for field-culture, the others for the garden. Beets may be sown from the early part of May until June, in drills about three inches apart, and they should be thinned to ten or twelve inches in the row. For early use, a small bed of the early turnip-rooted may be sown as soon in the spring as the ground can be fitted for the seed, and these will give good roots in June or July. Beets intended for fall or winter use, or for general crops, should not be sown too early; for such, if suffered to stand, become stringy and fibrous, and not unfrequently shoot up to seed, which renders them useless: indeed, it may be said that, for late beets, sowing in June is better than in April.

A rich, deep soil is best for the beet, and for all tap-rooted plants, and they should, after thinning, be kept free from weeds by frequent hoeings, or by otherwise moving the earth about them. Beets should be gathered before severe frosts occur, and may be pitted or put in cellars for winter use. The thinning of beets must be performed while they are young, and the young plants are excellent for greens, or as a substitute for spinage.

Within a few years the culture of the sugar-beet

has received much attention in this country, not only for the purpose of testing its productiveness in the manufacture of sugar, but as one of the most valuable of the roots grown for the feeding of animals during the fall, winter, or spring months. For dairy cows it is particularly esteemed; the ruta-baga or turnip, which has been generally given them where roots are used, communicating to the milk and butter an unpleasant taste and smell, which is entirely avoided by the use of the beet. The following method of culture has been recommended. Prepare the ground as for turnips or potatoes, by deep ploughing or harrowing, until it is fine. Open two furrows with the plough two feet apart, and put in a sufficient quantity of manure, according to the state of the ground; cover the dung with the plough by throwing a furrow of earth upon it, ridging as high as can well be done; level the surface of the ridge over the dung, taking care that there is a full proportion of earth over the manure for the seed to vegetate in. The seed may be sown with a drill or by the hand; and rolling completes the process.

In the garden, one ounce of beet-seed is required for a rod of ground, which would give about ten lbs. to the acre; but, in the mode recommended for field-culture, not more than one half that quantity will be needed; and if the seed be good, and sown carefully by hand, not more than three pounds per acre will be used. The beet requires to be kept clean by frequent hoeings; and the crop, when taken off, leaves the ground in excellent order for other crops. Some have recommended picking the leaves of the plants while growing, and feeding them to animals; but the practice is an improper one, and in many instances has produced disease, or scouring in stock thus fed. The root itself has no such effect.

BORECOLE OR KALE. *Brassica Oleracea.*

There are many varieties of this plant known, but

the best for cultivation are the Green Curled, the Cæsarean Kale, and the Thousand-headed Cabbage. The two last grow several feet in height, throwing out numerous branches, which yield a plentiful supply of leaves and sprouts for winter and spring. For the garden they may be treated as winter cabbages; but as the mode of culture, or even the plant itself, is but little known in this country, the following concise directions from Bridgeman may be acceptable. Those who wish for more ample directions may find them in Loudon on Gardening.

"The seed may be sown from about the middle of May to the first week in June, and the plants are set out in the month of July, in good, rich ground They are never so delicious as when rendered tender by smart frosts; they are valuable plants to cultivate, particularly in the more southerly states, as they will there be in the greatest perfection during the winter months. They will also, if planted in a gravelly soil, and in a sheltered, warm situation, bear the winters of the Western States; and may be kept in great perfection in the Eastern States if taken up before the frost sets in with much severity, and planted in trenches up to their lower leaves, and are then covered with straw or other light covering. The heads may be cut off as they are required for use; and in the spring, the stems being raised up, will produce an abundance of delicious greens. One ounce of good borecole seed will produce about four thousand plants, and may be sown in a border four feet by ten, or thereabout."

BRUSSELLS SPROUTS. *Brassica Oleracea.*

This plant produces from the stem small heads like miniature cabbages, being from one to two inches in diameter. The time of sowing and transplanting, and the after-culture, must be the same as that of the Borecole. These heads are very tender and fine when touched by the frost; they also yield

sprouts abundantly in the spring. If it be an object to preserve their natural colour while being cooked, a little soda or pearlash may be put in the water, and this addition, in the absence of salted meat, will make the common varieties of cabbage more tender.

BROCCOLI. *Brassica Oleracea Italica.*

Wherever broccoli and cauliflowers can be cultivated, they constitute one of the greatest luxuries of the table, and their excellence would seem to justify some little extra attention in growing them. In England, owing to the moderate temperature of that country, broccoli is raised with as little difficulty as the cabbage, and the plant is as common on the table and in the market the greater part of the year. In the middle, northern, or eastern parts of the United States, broccoli may be sown from the 10th to the 20th of May, and transplanted in July. The earth in which the plants are set must be in the best order, and highly manured with well-rotted compost. The plants should be in rows two and a half feet apart, and two feet distant in the rows. The ground must be kept constantly clean and loose by frequent hoeings, and in August some of the plants will begin to show flowers, and until November will produce a constant succession. Like most of the brassica tribe, they will sustain a considerable degree of frost without injury. Those who wish for directions for growing them extensively and at all seasons, may find them in Loudon or Bridgeman.

Much of the excellence of this vegetable depends on the cooking and preparation for the table. The heads should be cut when close and white, some of the outer leaves stripped off, the stalks cut off at the bottom, and then allowed to lie in salt and water for a little time. Put them into boiling water with a little salt, have plenty of water, and keep the vessel uncovered; serve them up with melted butter or gravy from meat. The Purple Cape Broccoli is the

only kind, out of a great number of varieties, that recommends itself to general culture or a place in a common garden.

CABBAGE. *Brassica Oleracea, etc.*

Of this plant there are many varieties, principally divided into early and late; the first being the smallest, and usually the most delicate. Of these, the early Sugarloaf, early Hope, early London Market, large Bergen, late Drumhead, Cape Savoy, and Curled Savoy, are the most esteemed. The cultivation of cabbages, or the sowing, is divided into fall and spring. Early cabbages should have the seed sown in September, and be transplanted into beds when cold weather approaches, where they can be protected through the winter with sashes, &c. At the end of the winter the ground must be fitted for them, and the plants set out two feet apart each way. They may also be sown in a hotbed in February or March, and in April transplanted into the garden; and, if in good ground, they will be fit for the market or table in June. If forced forward too rapidly in the hothouse, or not sufficiently aired, the plants will be weak, and the change from the bed to the garden will retard them materially.

Late cabbage should be sown in May, and transplanted in rows the middle of July; and, if three feet apart each way, the heads will be better than when nearer. Cabbage-plants at all times must be kept clean, frequently hoed, and, when taken up to be put into the cellar, should be placed with their heads downward, to allow the water in them to drain out; the weather, also, should be fine and dry. Slight frosts do not injure cabbages; but severe and repeated ones render them unfit for preservation. A very good mode of preserving cabbages through the winter is to dig a trench in a dry soil, in which the cabbages, divested of their outer leaves, are placed, and the earth filled in up to their necks. Over these

heads some covering must be strewed, which will not press on or injure the heads, and a coating of earth may be added when the frosts become intense. Cabbages so saved will come out in the spring fresh, and of fine quality when well preserved; but there is no method which is always successful, as the most experienced gardeners admit.

Cabbages are used in various ways, and are generally much esteemed. Savoys rank next to the cauliflower and broccoli. Red cabbage is excellent for pickling. It must be shred fine, and sprinkled with salt. Let it be forty-eight hours, and then turn off the water or brine, and pack it in a jar. Prepare vinegar with ginger and spices over the fire, and, when boiling hot, pour it over the cabbage. Cover the jar closely, and set it away in a dry, cool place. Sourkrout is made by chopping the heads very fine, and placing it in layers in a barrel, with alternately a handful of salt mixed with a few caraway-seeds, until the barrel is filled. A heavy weight is placed on the mass, and an active fermentation soon commences. After this has ceased, the weight is removed and the cabbage headed up. A little use is required to accustom the palate to this preparation, but it is a healthy and valuable article of food.

CAULIFLOWER. *Brassica Oleracea Hotrytis.*

This is an excellent vegetable, and by epicures is ranked next to young pease and the Lima bean. For early use the seed is sown in September, and the plants preserved by frames in hotbeds through the winter until about the middle of April, when a place in the garden may be prepared for their reception. The ground should be watered before transplanting, and great care should be taken to raise each plant with a ball of earth, that the fine fibres of the roots may not be disturbed, a thing essential to the quick growth of the cauliflower.

For late cauliflowers the seed may be sown from

the first to the middle of May, in a rich earth, in drills, and transplanted in July into a fine, fertile soil, at distances of three feet, and the ground about the plants should be kept loose by frequent stirring. When heading, if the leaves are gently drawn together at top, it will improve the head by partially blanching them.

CARROT. *Daucus Carota.*

There are six or seven varieties of this vegetable, of which the early Orange, early Horn, and Altringham are the best for the table ; and the Long, Lemon-coloured, Blood-red, and large White the best for field culture.

The carrot is a native of Great Britain, and grows wild in many places, as does the potato in South America. It is a valuable vegetable, extensively used for table purposes, particularly in soups and stews, and is exceeded by none in its good effects when fed to animals. The general culture is the same as that of the beet, requiring a soil deep, and made rich and fine by manuring and working for previous crops. The main crop should not be sown earlier than the tenth or the middle of May (though some may be sown a month earlier), as early carrots, like early beets, are apt to throw up seed-stalks, which render the vegetable worthless. For field-culture, the earth may be thrown into ridges two feet and a half apart, manure spread in the furrows, and the ridges split and thrown back upon the manure ; and the seed sown on the top of the ridges after partial levelling. A light rolling is useful, to press the earth about the seed. The carrot will vegetate quicker, and come forward more rapidly, if the seed, previous to sowing, is mixed with sand or very sandy loam, and kept moist until it begins to germinate, when it must be sown and immediately covered. The plants should be about four or five inches apart in the rows, kept clean, and will be fit

to gather in October or November. Carrots may be preserved by being buried in sand or in a cellar; but they must be secured against frost as soon as taken from the ground, not being as hardy as the ruta-baga, but more so than the beet. From four to eight hundred bushels may be expected from an

CORN SALAD.—Landes Lettuce. *Valeriana Locusta.*

This plant is called Corn Salad in England, from its growing wild in cornfields, or rather grainfields, in that country; and, being sufficiently hardy to endure the winter, is productive of considerable mischief where it abounds. It is cultivated as a winter salad or for early spring use. It may be sown in August or September, in drills six inches apart, the plants kept clean of weeds, and in very severe weather have a slight covering of straw thrown over them. We would hint to those who attempt its culture that it should be rigidly confined to the garden, as it may otherwise add another pest to our fields: as unwelcome a guest as the Canada thistle proved to France, when introduced by the Jesuits as an ornamental plant into the flower-gardens of Paris.

CELERY. *Apium Graveolens.*

The seed of this plant may be sown from the first to the middle of April, either broadcast or in drills. If broadcast, let the bed be beat smooth and even with a spade after the seed is sown, and then a quarter of an inch of fine earth sifted over it. If in drills, let it be sown six inches apart and half an inch deep. The plants are put out in May into a nursery bed, three or four inches apart, and from this those for fall use must be transplanted to the trenches in July, and those for winter use in the beginning of August. To describe the manner of after-cultivation would require more space than can be afforded here, and for the processes of trenching,

earthing, and blanching, reference may be had to Bridgeman, Fessenden, or Loudon. Celery affords a striking proof of what culture can effect on a plant, as few things are more unlike than the much-esteemed celery and common smallage or smellage, the original plant.

CHIVES or CIVES. *Allium Schœnoprasum.*

This is a hardy perennial plant, a small species of onion, and a native of several European countries. It grows in tufts, and is propagated by dividing these tufts or by offsets from the roots, and these, planted either in spring or in autumn, in rows along beds or borders, will take root, and soon increase into bunches or tufts as large as desired. It will last without dividing three or four years, when the tufts must be renewed by a farther separation. As it is very early in its growth, it is much esteemed by many as a salad.

CRESSES.

Cresses are of two kinds, the common Garden Cress, *Lapidium Sativum*, and the Water Cress, *Sysymbrium Nasturtium*. The first is a small salad herb of two varieties, of which the most common is called peppergrass. It must be sown in drills very thick, and, in order to furnish a constant supply, may be sown every week. It must be used while young to have it in perfection. Cress can be grown in a few hours by making the vessels containing the seed part of a galvanic circle; and is sometimes grown in porous earthenware vessels of a pyramidal form, on the sides of which gutters are made for the reception of seed. This is placed on the table, and the cresses gathered at pleasure. The Water Cress grows in streams and in clear springs, and in such places may be cultivated readily by transplanting. It is grown extensively for the London markets, and is an early and very healthy vegetable for salads.

CUCUMBER. *Cucumis Sativus, etc.*

Of this plant there are nearly a dozen varieties, which are divided into early and late, or cucumbers for the table and for pickles. The difference in value between early and late cucumbers is illustrated by the fact, that those forced for the London markets in March are worth a guinea a dozen, while in August the same number may be had for a penny.

Cucumbers should be planted in hills about four feet apart, early in May. Those intended for pickling may be planted later. Before planting, the ground must be well prepared by mixing a shovelful of well-rotted manure with the earth of each hill. Two or three plants are enough to a hill; but a dozen at first will do no harm, as the greater the number, the greater the chance that some of them will escape unhurt the attacks of the cut-worm, yellow bug, &c., and, after the danger is over, all may be pulled out except the requisite number, leaving the most vigorous plants. The seed should be sown about half an inch deep. The plants must be kept clear of weeds, and in very dry weather they require frequent watering. Artificial impregnation of the female blossom, by placing the male flower in contact with them, and twirling them with the fingers in such a manner that the pollen will fall on the seed-vessels of the female flower, is practised by some gardeners, and would seem to be necessary where they are raised in forcing frames, to which bees or currents of air do not have free access. In the open air, however, this process is unnecessary, as the winds and bees will distribute the pollen to every female flower as fast as it is accessible. Cucumbers should not be more than four inches long when gathered, crisp and brittle, and of a fine green. No cucumbers should be allowed to remain on the bearing vines till they are yellow, as it will at once

check their productiveness. Tobacco-dust, or finely sifted charcoal powder, will keep off the yellow fly. The black grub must be sought out and killed, and a daily examination of the vines while young will be useful in detecting depredators, and promoting the growth of the plants.

EGG-PLANT. *Solanum Melongena.*

Of this plant there are two varieties; the purple for cooking, and the white for ornament. The seed must be sown in a hotbed in March; the young plants transplanted into pots in May, and placed in a frame until June, when they may be turned out and planted, with the balls of earth from the pots entire, when they will grow readily. They cannot endure a low temperature, and from the first germination of the seed it must be avoided. In cooking the mature fruit, slice and parboil it in a stewpan; after drawing off the water, it may be fried in batter made with wheat flour and eggs, or in butter with bread grated fine, seasoned before it is put in the pan with pepper, salt, thyme, &c., to suit the taste. Some use marjoram, summer-savory, parsley, onions, &c. Egg-plant seed require steady heat to vegetate freely, and the sashes should be kept closed till the plants come up; afterward air may be admitted.

ENDIVE OR SUCCORY. *Cichorium Endivia.*

This is a valuable plant, of China origin, and the kinds principally cultivated are the Green and White Curled. The Green Curled may be sown in May, if an early crop is desired; but, as these are apt to run to seed, later sowing in July or August is preferred for fall plants. When the plants are five or six inches high, transplant them into a rich soil in rows fifteen inches apart each way. They must be hoed and treated as lettuce. For blanching the heads, select the best plants, draw the leaves carefully together when perfectly dry, and tie them with bass

or other strings, but not too tight. The curled sort will blanch very well by drawing the leaves together and placing earth around them; but the larger kinds require the precaution of tying. When thus treated, they become white, crisp, and excellent for the table.

The Wild Endive, *Cichorium Intybus*, is extensively used in France in preparing coffee. The roots are taken up in the fall, dried, and ground; and two ounces of the powder is allowed to a pound of coffee. The aromatic fragrance of coffee is greatly increased by this addition, and its flavour much improved: while the use of this root renders it more healthy and exhilarating as a beverage.

HORSERADISH. *Cochlearia Armoracia.*

The Horseradish is a healthy and useful vegetable, and deserves a place in a garden; but it should be confined to the division allotted it, or it will spread and become a nuisance. It is best propagated by cuttings, and the crown of the root is the best for this purpose. They may be planted in rows two feet apart, and eight inches in the rows. The soil must be rich and deep. It may be grown in a permanent bed; and if, when taking up the roots, or in digging over and manuring the ground, some offsets be left in the ground, a successive supply may be had for years.

GARLIC. *Allium Sativum.*

This plant is the seasoning of various dishes, and is used in the preparation of pickles, &c. It is propagated by offsets in the spring or fall, in rows a foot or eighteen inches apart, and six inches in the row, in well-manured, deep ground.

INDIAN CORN. *Zea Mays.*

Corn is one of our best known and most valuable field-crops; but, as it is also excellent for the table,

it should find a place in every garden. The best kinds for cooking are the Yellow Sioux, early Canadian, early Tuscarora, and Sugar or Sweet Corn. It may be planted in hills or drills, should be highly manured, and the ground kept free from weeds by hoeing as often as they show themselves.

Green corn, whether boiled, or roasted, or mixed with beans in succotash, constitutes a most nutritious and excellent food; and, if separated from the cob when green, and dried while in that state, it may be converted into several superior dishes, and is highly prized by epicures.

LETTUCE. *Latuca Sativa Crispa.*

The best kinds of this plant for common cultivation, as they are more hardy than others, are the large Green Curled, Dutch or Cabbage, large Greenhead, and Green Coss; the Silesian, Sugarloaf, and Loaf Coss are also much esteemed, but are not so suitable for ordinary culture.

For early lettuce, sow on a rich, fine soil in September, broadcast with spinage; and, during the winter, cover with straw, salt hay, or hemlock or cedar brush. As early as the frost is out, prepare a bed with compost and fine mould, and transplant the young plants into it in rows twelve or fifteen inches apart each way. This will afford room for fine heads, and for working the earth around the plants.

Lettuce may be sown at different times from the opening of the spring until June, and a succession be secured. Lettuce may be obtained very early by sowing in hotbeds in February or March, and transplanting into rich ground. Lettuce intended for heading must be hoed frequently. The Coss Lettuce requires to be blanched; and this is done by gathering up the leaves of the plant and tying them with strips of bass, as directed for Endive. Lettuce is a healthy vegetable, easily cultivated, and generally welcome to the table.

MELON. *Cucumis Melo.*

This delicious vegetable grows wild in Asia, and attains a perfection in Bokhara, Herat, and Cabul unknown to other parts of the world. The best melons of Africa are grown on sandbars left by the subsidence of the waters of the Nile; and the Isle of Cyprus furnishes the best to Europe. The cooling and salubrious qualities of the melon render it a deserved favourite in all countries where it can be produced.

The ground may be prepared for melons early in May, by manuring with compost and thorough digging. For the Musk or Cantelope Melon, dig holes six feet apart each way, twelve inches deep, and eighteen inches over, into which put six inches of old, rotten dung, then four inches of earth, and mix them thoroughly together; then put on more earth until a slight elevation is made, on each of which ten or a dozen seeds may be sown two inches apart, and covered with earth half an inch deep. Three vigorous plants will be enough for each hill, and they must be thinned down to this number.

WATERMELON. *Cucurbita Citrullus.*

The Watermelon, though possessing many of the characteristics of the former, belongs to a different genus of plants, having a similar origin, and being most famed in the countries noticed as being celebrated for the Muskmelon. Watermelons require a very rich, light soil, abounding in vegetable mould, and by manuring made as fertile as possible. The hills should not be nearer than seven feet, and the planting and general culture may be the same as for the Muskmelon. We have known fine melons grown by making a long pile or mound with manure taken fresh from the stables, allowing it to slightly heat, then covering it with good loam and reversed turf, into which the seed at the proper time of sowing were put. This method has been found success-

ful in bringing the plants forward earlier than they would otherwise be, and thus cause them to arrive at maturity before the autumnal frosts overtook them. The level, sandy region, reaching from Long Island to the Chesapeake, is the most famed for melons of any district in the United States, though excellent ones are grown in the states farther south. Melons, cucumbers, squashes, pumpkins, &c., should never be planted in the vicinity of each other.

MUSHROOM.

Few persons will be disposed to engage in the culture of this article; and as it is with some difficulty the plants fit for culture are distinguished from those which are decidedly poisonous (toadstools), except by experienced individuals, they may be passed over, remarking merely that the process of cultivating the mushroon is singular and curious, and that ample details may be found in Bridgeman and Loudon for growing it in hotbeds or otherwise.

MUSTARD. *Sinapis.*

There are two kinds of this vegetable cultivated, the white and the black, both natives of Europe, and growing spontaneously in many places. The white produces the largest seed, and a pure sweet oil is made from it to a considerable extent. It is also used as a medicine; and, when potted with pickles, the seed imparts an agreeable flavour, and renders them more salutary. The condiment found on all our tables, called mustard, is prepared from the seed of the black mustard, and, like the other, is by many considered useful in giving tone to the stomach. The mustard, when young and tender, is an excellent herb for greens; and, when cultivated, may be sown in drills in rich, clean ground in April or May.

NASTURTIUM. *Tropæolum.*

This plant is chiefly valued for its berries, which,

when gathered green, but of full size, plump, and tender, and pickled, are a very good substitute for capers. The vinegar must be prepared with spices, and poured on while hot. It is an annual plant, produces abundance of fine orange-coloured flowers, and may be planted in April or May. Supports or trellises of some kind must be provided on which it can climb; though, if planted near a fence, other support may be dispensed with.

ONION. *Allium Cepa, etc.*

There are several varieties of the common onion, such as the white, yellow, red, &c., but the mode of culture is nearly or quite the same with all. Those of medium size are the best, of firm growth and well ripened. The seed should be sown early, in ground prepared by digging in a liberal supply of old, rotted manure. That from a pigpen is generally preferred when it can be had. The ground must be made fine, the seed sown in drills about an inch deep, and the rows twelve inches apart. The plants must be well attended when young, by keeping the earth loose about them and free from weeds. After the herbs begin to form, hoeing is inadmissible, and weeds, if they exist, must be taken out by hand. Onions are best kept in a place very dry and moderately cool; if it be warm and damp, as many cellars are, the bulbs will sprout and become worthless. From four to eight pounds of seed will be required per acre; the least quantity when cultivated for the bulbs, and the greatest quantity when grown for the early market.

The Welch Onion, *Allium Fistulosum*, is hardy, resembling much what farmers term scullions, or onions without bulbs; and, if left in the ground, will put out leaves early, and be soon fit for the table.

The Tree or Top Onion, *Allium Proliferum*, is propagated by planting the bulbs of the last year, or the small onions or seeds that form in successive

clusters on the tops. It is one of the best varieties; the only danger is in keeping them over the winter; but if kept dry and secure from freezing, there will be no difficulty.

PARSLEY. *Apium Petroselinum.*

Of this plant, which is much cultivated for pot-herbs and for garnishes, there are several kinds, such as the Curled, Common or Single, Hardy, and Large-rooted. The last is cooked for the table, like the common parsnip, and at the same season.

The seed should be sown in drills; if for summer use, in April; if for fall or winter use, in August. In dry weather the seedbeds must be frequently watered; the young plants must be thinned to a proper distance, and kept free from weeds. If taken up in November, or before severe frosts, and put in earth in a well-lighted cellar, the leaves will keep green a long time. Parsley is good on baked meats and in fish sauce, and is relished by most persons.

PARSNIP. *Pastinaca Sativa.*

Like the carrot and beet, the parsnip requires a light, rich, and dry soil; and the sooner the ground is prepared in the spring, and the seed put in, the better the roots will be, as a long season is required for their perfection. The seed must be sown in drills the same as carrots, and left, in thinning, eight inches apart in the rows. They must be kept clean by frequent hoeings, and in the autumn are fit for use; but as they improve in quality by being exposed to frost, and will remain in the earth without injury, those intended for spring use are left in their beds, and are usually found in a fine state in the spring months. The seed of this plant vegetates with some difficulty; and in a light, dry soil, should have the earth pressed upon them with a roller immediately after they are sown.

PEPPER. *Capsicum.*

There are many varieties of the Capsicum, but those found best adapted to this country are the Bell, Tomato or Squash, and long Red Peppers. Natives of tropical regions, they are tender plants, but are much cultivated for pickles, condiments, medicinal purposes, &c.

The plants may be started in a hotbed in March, or sown in the open air in a warm border in May. They should be forced forward as rapidly as possible, and the earth should be made rich and warm. Pigeons' or hens' dung has been thought the best for these plants; but in a rich, warm soil they will generally succeed in ripening their pods. The plants set for bearing should stand eighteen inches apart, and some gardeners prefer two feet each way. For pickles, peppers must be gathered after their growth is attained, but before they are fully ripe. The Bell Pepper, having a thicker envelope, is considered superior to the other kinds of pickles, and is therefore preferred for planting.

PEA. *Pisum Sativum.*

The Pea is one of the most valuable plants in garden or field culture, and many varieties of them have been produced, and may be found on the catalogues of our principal seedsmen. The general subdivisions of the garden peas are dwarf and tall, or early and late; and of each of these there are many kinds. Of the early or dwarf pease the Washington, Bishop, Charlton, and Blue Prolific are perhaps the best known; of the tall or later kinds, the several varieties of Marrowfats are unequalled. The pea called the Sugar Pea is cooked like stringed beans, the pod having no tough inner film, and is boiled whole. Of this pea there are two kinds, the Dwarf Sugar and the tall Crooked Pod; the first growing three, and the last six feet in length. The early or dwarf pease

require sticks to support them about three feet in length, and the tall or later varieties about six feet. The Bishop or early Dwarf is, however, only one foot high. Different modes of sowing pease in the garden are practised, as in drills, rows, and circles, and these double and single ; but care must be taken to have the rows or drills proportioned in distance to the height the pease are expected to grow ; or from four to seven or eight feet apart. In the widest spaces other vegetables may be planted, such as roots that will come to maturity after the pease are ripe and the brush is removed.

Pease may be started in frames or hotbeds if placed in pots, and will be much earlier than if grown in the open air. A quart of pease will plant from one hundred and fifty to two hundred feet in the row ; the early dwarfs three to an inch, the middle sorts three to two inches, and the large sorts an inch and a half apart. The Pea will produce better for being frequently hoed, and the earth drawn up to the plants; and care must be taken to have them bushed early, that they may have proper supports.

Pease should always be cooked immediately after being gathered, or much of their sweetness is lost. " Taste and try" is the only rule in boiling them, as a little difference in age and hardness will make much difference in the quickness and ease of cooking. Some put in a sprig or two of spearmint with the pease in boiling, as imparting a finer flavour, and a little salt in the water should never be omitted. For field-culture of pease, reference may be had to the agricultural journals of the day, in which the different processes, and the value of the crop, may be found fully described.

POTATO.

There are two plants extensively cultivated known by this name ; one the common Potato, *Solanum tuberosum*, and the other the Sweet Potato, *Convolvulus*

batatas, so valuable in the South. The seed end of the potato (or the one having the most eyes) should be selected for planting where early roots are desired, as the experience of the Lancashire gardeners, who supply the London market, proves that potatoes from these shoots will be ten or fifteen days earlier than from sets from the other extremity. From ten to sixteen bushels will be required to plant an acre, according to the variety used, and the manner of cutting or planting them. Potatoes usually come to maturity whether planted early or late, or from April to July, requiring a rich earth, full of vegetable mould, rather moist than dry, and kept clean and free from weeds. The common practice is to earth them up once or twice at hoeing, but it is not certain that this is the best method of cultivation, as some of the best crops on record were grown without hilling. The probability is, that some varieties require earthing more than others. From three to six hundred bushels may be obtained from an acre.

A moderate hotbed is required for the Sweet Potato in this climate. In a bed of this kind, let some roots be planted early in April three or four inches deep. In a month sprouts will be thrown up, which, when three inches above the ground, are to be parted off, and transplanted into a rich, light soil, in rows four feet apart. If the potato is allowed to remain, more shoots will appear, which may be afterward set in the garden as before. They must be hoed till the vines begin to cover the ground; and, in all cases where the earth is light, a shovel of manure should be incorporated in the hill before the sprout is put out. A peck of good sound roots in a bed, and the shoots treated in this way, will usually give from twelve to eighteen bushels of good roots, which are highly prized for the table.

The Rohan Potato, lately introduced from France, promises to be one of our best varieties, its pro-

ductiveness being great, and the quantity of seed per acre small; five bushels being deemed an adequate supply.

PUMPKIN. *Cucurbita Pepo.*

The most valuable varieties of this well-known vegetable are the Fine Yellow, Connecticut Field, Mammoth, and Seven-year Pumpkins. It succeeds the best in new soils abounding in vegetable matter, and is excellent for feeding cattle or horses, boiling for swine, and for many culinary purposes. At some of the horticultural exhibitions of Philadelphia, specimens of the Spanish or Mammoth Pumpkin were shown, weighing from two hundred to two hundred and thirty-eight pounds.

The common mode of cultivation is to plant the seed with Indian corn, and great crops of them are sometimes grown in this way. Too many plants in this case must not be admitted, as they will, if too thick, injure the crop of corn very materially. Pumpkins of good quality make excellent pies, and, stewed and mixed with wheat-flour, or with Indian meal, make a sweeter and better bread than either would alone.

PURSLANE.

This plant is found in almost every garden, and, if left to itself, soon becomes a nuisance, and is treated as such. The young shoots, however, make a very good salad, and it is much used as a potherb or for greens. It may be cultivated where desired by sowing the seed in May, either in drills or broadcast. It does not readily admit of transplanting.

RADISH. *Raphanus Sativus.*

The best radishes for spring culture are the early Scarlet, short and long, Scarlet Turnip, and White Turnip; and for summer, as resisting heat better, the White Nonpareil, Yellow Turnip, and White and

Black Spanish. The excellence of the radish depends mainly on the rapidity of its growth, giving freshness and crispness. The Short-top Scarlet may be sown as early in the spring as the ground can be fitted, or by the middle of March. The ground must be rich, well worked, and, if in a warm and protected border, the plants will be the better for an early crop. Some gardeners sow them in drills between the rows of onions, the radishes getting their growth and being removed before the room is required for the onions. If successive crops of radishes are desired, they may be sowed every two weeks from March until May, always remembering that the late-sown ones should be of the kind preferred above for summer. Radishes are frequently grown in frames or in hotbeds, and, if of good quality, are always acceptable, and by many considered a luxury after the passing away of a severe winter.

RHUBARB OF PIE-PLANT. *Rheum.*

There are three varieties of this plant cultivated; the *Rheum Rhaponticum* and *Rheum Unclulatum*, for the sake of the leaf-stems, and the *Rheum Palmatum*, which is chiefly grown for the sake of its root, so extensively used in medicine.

Rhubarb may be propagated by offsets taken early in the spring, or from seed sown in March or April. Wet weather is the most proper time for transplanting, and the second year is the most critical time with the young plants. The roots of the Palmatum should remain six or seven years before they are taken from the earth, as they require a long time to reach perfection. The plants of all these kinds must have a deep, rich soil, as the size of the stems of those used for cooking, and the roots of the kind cultivated for medicine, are mainly depending on this. The English gardeners have produced one or two varieties of the Rhaponticum, the Giant Rhubarb and the Victoria, much superior to the old kinds

The stems are the parts used, and these peeled, washed, and treated in the manner of apples, by stewing, and the addition of spices, make excellent pies, tarts, &c. The growth may be much forwarded in the spring by placing a barrel or box over them, and piling stable manure around the outside. A few good roots will furnish a supply for a family, at a time when other green articles for pies are difficult to be obtained.

SPINAGE. *Spinacia.*

For summer use, sow in April; for fall use, in August; and for spring use, in September. Spinage is a very hardy plant, and, sown late, it will live through the winter if covered with straw, salt hay, or cedar brush during the most severe weather. By this course early and good crops can be obtained. The difficulty with spring-sown plants is their propensity to run to seed and become worthless in hot weather. The seed may be sown broadcast or in drills; but the ground must be rich, and kept clean by frequent hoeing. There are several varieties of this plant, of which the large round-leaved is considered the best, being hardy and productive. The New-Zealand Spinage, *Tetragona expansa*, is of late introduction, but promises to be a useful vegetable. Its growth is luxuriant, and a space of two or three feet in the best soils may be left between the plants. It endures the summer heat better than the common varieties, and should therefore be sown in the spring in hills, two or three seeds together.

Spinage is one of the best of potherbs, and may be boiled in clear water, drained, salted, and buttered to the taste, or boiled with meat, as other greens usually are. As one of the earliest cultivated plants, it deserves a place in every garden.

SQUASH. *Cucurbita Melopepo.*

The squashes best deserving of cultivation are the

Early Bush Squash, Vegetable Marrow, and Lima Cocoanut or Acorn Squash. The Crooknecks are valuable varieties, as are the Valparaiso and Cushaw; but for the table we prefer the first-named kinds. The general cultivation of the squash is the same as that of the cucumber and melon; planting in well-manured ground in hills, the bush kinds four feet apart, and the runners from six to eight feet. Summer squashes are used before ripening; winter squashes must ripen, but should be gathered before frosts occur. They must be kept dry, and, if not allowed to freeze, will keep good for some months.

SALSIFY. *Tragopogon Porrifolius.*

This plant, called also the Vegetable Oyster, is extensively cultivated, both for its tops and roots; the first being gathered while fresh and tender, and cooked and eaten as asparagus; and the latter, being cut into thin slices, are boiled in milk and water till soft and tender, then mashed and slightly thickened with flour, after which they are fried in lard or butter. In this state they are considered a luxury. They are cultivated by being sown in drills in April, an inch deep, and the drills one foot apart. The plants must be thinned to the distance of six inches from each other, and the after-culture is the same as for carrots or beets. The roots may be gathered in the fall, and packed in earth or sand, or allowed to stand where they grew till wanted.

OMATO. *Solanum Lycopersicum.*

The Tomato has long been grown in gardens for the beauty of its fruit, but within a few years its cultivation has been much extended, and it is now generally esteemed both for its culinary and medicinal properties. The Tomato may indeed be considered the fashionable plant of the day; and not to know and admire it "argues one's self unknown." Still it must be admitted that the taste for it is acquired,

and a strong confidence in its medical properties is necessary to induce the uninitiated to pronounce it "delicious." The plants may be started in moderate hotbeds, and transplanted as early as the weather becomes warm, or in the latter part of May, though much will depend on location, and the object of delay will be to secure the plant against cold or frost. The plants need support; but, if placed at a considerable distance, say five or six feet from each other, they will ripen their fruit without. The Tomato may also be grown by sowing the seed early in May in a warm border, on mellow, rich ground, to be transplanted in June; or, perhaps better, they may be sown where they are to stand in hills, and superfluous plants pulled out.

Tomatoes are used for the table in various ways; served up in sugar as a dessert, or substitute for peaches, strawberries, &c.; made into pies and tarts; preserved as other sweetmeats; pickled in brine for winter use; and converted into a capital catsup. In preparing the latter article, put one pint of salt to a peck of tomatoes; bruise the fruit, and let it stand two days; strain it dry, and boil the juice till the scum ceases to rise; add two ounces of black pepper, as much pimenta, an ounce of ginger, an ounce of cloves, and half an ounce of mace. Boil the whole together, and bottle for use.

TURNIP. *Brassica Rapa.*

For summer turnips, sow early in the spring, on a moderately rich soil, and if new, or abounding in vegetable matter, the turnips will be better than if sown on land rendered rich by recent manuring. The seed may be sown broadcast and raked in. Some get two crops in a year from the same ground by sowing the first in March and the last in August. Where new land is not to be had, sandy or gravelly soils will produce the sweetest turnips, and usually the largest roots. For the fall crop the seed should

be sown about the first of August, and the roots should remain in the earth as long as they can be left with safety, as frosts improve the quality of this root materially.

There are many varieties of the turnip cultivated, of which the early White Dutch, Garden Stone, Red and White Top, are grown commonly in gardens; and the Norfolk, the Globe, the English White or flat turnip, the Aberdeen, and the Swedish or Ruta-baga, are for late or field-culture. The great enemy the turnip has to encounter is the small bug termed the turnip-fly, which devours them in the seed-leaf; and there should always be a supply of lime, soot, charcoal, and tobacco-dust provided, to use as soon as the plants are above ground, or on the first symptoms of attack. After the rough leaf is formed, the plants may be considered safe. Fine dust, it appears to matter little of what kind, annoys these insects much, and, if such dust is freely thrown over the field until the rough leaf appears, they are rarely disturbed afterward.

The Globe, Aberdeen, and Ruta-baga are principally cultivated for the feeding of sheep and cattle; and perhaps in no way can a greater amount of animal food be obtained from a given quantity of land than by the growing of these roots. The introduction of the field-culture of the turnip marks one of the most prominent eras of improvement in agriculture; and few things have contributed so much to the high state of cultivation in England, and the rapid increase of the grain-crops in that kingdom within the last quarter of a century, as the turnip. The value of the turnip-crop in England has been estimated at from 60 to 70 millions of dollars; and a very large proportion of the beef and mutton consumed in that country is made entirely from it. In the United States the culture of these roots is comparatively recent, and though, owing to the difference in our climate and seasons, it is not probable

the turnip can ever become of as much importance here as in Britain, still there are few crops more certain, or that more amply repay the grower. For the best methods of cultivation we must refer to the agricultural journals, merely remarking that the middle of June will be early enough for sowing; that the soil should be rich and friable, and drained of all surplus water; the rows about two and a half feet apart, and the roots from eight to twelve inches distant in the rows; that a pound of seed is sufficient for an acre equally distributed, and may be sowed either by the hand or with the drill-barrow.

POT AND SWEET HERBS.

We add, as proposed, a short list of such herbs as are most useful for cooking or culinary purposes, or are most prized for their aromatic or medicinal virtues.

Burnet. *Poturium Sanquisorba.*—This plant is by some used like parsley, to garnish baked or roasted meats; and in very warm weather, a few sprigs of it in a glass of sweetened water makes a pleasant and grateful beverage. Sow the seed in the spring, on clean, light, good soil, and it will soon be fit for use.

Balm. *Melissa Officinalis.*—This plant is cultivated in the garden for its febrifuge properties, and also because it is a plant of which bees are fond, and is consequently much raised by the apiarian. It is propagated by seed, but most usually by division of the roots or slips. It is perennial, and only requires to be kept clean from weeds.

Chamomile. *Anthemis Nobilis.* — This plant is grown for its aromatic and medicinal properties. Its virtues seem to be concentrated in the flowers, which should be preserved with care. It is a perennial, and may be propagated by division of the roots. The chamomile border must be kept free

from weeds, and have a little fine, rich mould occasionally thrown over it.

Caraway. *Carum Carui.*—The seed of this plant is extensively used in domestic cockery, and is much esteemed by confectioners. If it is sown in autumn, the plants will produce seed the next season; if sown in the spring, not until the succeeding year.

Coriander. *Coriandrum Sativum.*—This plant is an annual, and is cultivated for its seed, which is used in some medicinal preparations, and is also covered with sugar for a sweetmeat.

Fennel. *Anethum Fœniculum.*—This plant is considered very wholesome, and the stems, earthed up, are eaten as celery, while the leaves are by some much prized in broths, &c. The seed is a carminative, and has been recommended in diseases of the chest. Fennel can be propagated by sowing or by division of the roots. It is a perennial.

Lavender. *Lavandula Spica.*—This is thought to be the plant from which the spikenard ointment, so precious among the ancients, was prepared. It is among the most powerful stimulants of the nervous system. The distilled oil of this plant is sometimes called Oil of Spike, and is a part of several aromatic compounds. It is propagated by seeds.

Marjoram. *Origanum.*—There are two kinds of this plant cultivated in gardens; pot marjoram and sweet marjoram. It is much used in food to make it more savoury. The seeds may be sown broadcast or in drills, and on the spot where they are to remain, as they do not well bear transplanting. The best time for sowing is April, or early in May.

Mint. *Mentha.*—There are two kinds of this plant cultivated, *Mentha Viridis*, or Spearmint, and *Mentha Piperita*, or Peppermint. The spearmint was much used by the ancients. Pliny says, "you will not see a husbandman's board in the country on which all the meats, from one end to the other, are not seasoned with mint." A sprig of it was thrown into

milk to prevent coagulation in the stomach; and it is still one of the stomachics. Peppermint is chiefly cultivated for distillation. The mint is cultivated by division of the roots or by shoots, and requires a rich but rather moist soil.

ROSEMARY. *Rosmarinus Officinalis.*—This plant is much esteemed on account of its fragrance. Like other perennials, it may be cultivated from seed sown in the spring, and a bed of it will last for years if occasionally dug over and covered with fine mould.

SAGE. *Salvia Officinalis.*—The is one of the most valuable of garden herbs, being used extensively for various culinary purposes, particularly in the preparation of meats, making of sausages, &c. It may be sown in beds of fine rich earth in the spring, and successive crops will be produced from the roots for several years.

SUMMER-SAVORY. *Satureja Horiensis.*—This plant, like sage, is used in many culinary preparations, imparting a pleasant flavour and odour. It is cultivated in beds from seeds, and should be sown annually.

There are still other plants used by the cook and the confectioner, but the above are all that are usually required either as pot or aromatic herbs. Much of the goodness of all herbs depends on their being dried for use at the most suitable time, or when the properties for which they are esteemed are in the most perfect state. Herbs are usually the most vigorous and full of flavour about the time they begin to blossom; and the first or last cuttings are never as valuable as those taken in the height of the season. All herbs should be gathered on a dry day; the roots and dirt carefully cut away; the plants spread, or tied up in small bunches, and dried by a stove, or in a Dutch oven before a common fire, as quick as it can be done. The best way of preserving herbs is to pick or rub off the leaves as soon as they are dry, reduce them to a fine powder, sift them, and pack them in close bottles. The Shakers, who are

much celebrated for the excellence of the herbs they cultivate and prepare, dispose of large quantities yearly, first compressing them in dense masses, and then dividing them into small parcels for the market.

CHAPTER XVIII.

THE FRUIT-GARDEN.

Choice of Soils.— Exposure.— Transplanting. — Seedlings.— Grafting and Budding.

The preceding chapter was devoted to a description of the farmers' kitchen garden, and a list of such plants and vegetables as will be found most useful in occupying it; the present will be devoted to the no less essential part of every farm, the fruit-garden or orchard. Few there are, whether farmers or others, who cannot find a spot for a few trees about their dwellings, and nothing can contribute more to the health, comfort, and pleasure of a family than to have such a spot, however limited, occupied with choice fruit-trees; and thus, by care in the selection of varieties, some of the most important fruits may be had in perfection the year round. Nothing can excuse, in any one who has the means, inattention to the fruit-garden or the orchard; and among those who are possessed of these, nothing but ignorance or a want of taste could tolerate the inferior fruits that so much abound, while the finest varieties may be obtained and cultivated with equal ease.

As in the kitchen-garden, so in the fruit-garden, the first thing to be attended to in its formation is the selection of a suitable soil and its preparation. As a general rule, it may be remarked, that no soil

which is retentive of water, or which has a hard subsoil, is fit for a fruit-garden. The soil should be permeable to the depth of two and a half or three feet, so that the tender fibres of the roots may penetrate it easily, and seek sustenance in all directions, without coming in contact with stagnant water, sour earth, or hardpan. A rich, deep loam is the best for fruit: not too light or sandy, but retaining sufficient moisture for the use of the tree. If the soil is naturally too hard or stiff, it must be dug to a sufficient depth and mixed with vegetable mould; and if inclining to wet, it must first of all be effectually drained. Unless this is done, all efforts to produce good fruit will be unavailing. The trees will flourish but a short time; the influence of the bad soil below will soon show itself in the mossy trunks, the stunted branches, and the small, inferior fruit produced, and these symptoms in any orchard will indicate the difficulty, and the mode of remedying it. To make the soil dry, deep, and rich is the first thing to be attended to in a fruit-garden.

Exposure is another thing that cannot be safely overlooked in commencing an orchard. The principal enemy to fruit in the United States is the cold, northeast storms which frequently occur about the time of blossoming, and which act with much more pernicious effect on fruit-trees unprotected and fully exposed to their force, than on those partially or wholly sheltered. Close, confined situations must, however, be avoided, as, without the sun and a free circulation of air, healthy trees and fine fruit cannot be expected. A southern exposure is to be preferred where it can be had without incurring other disadvantages. A position open to the south, and protected on the north by a belt of woodland, or planted-out forest-trees, will, where other things are favourable, rarely fail of giving good fruit, and escape the blights which so often destroy the hopes of fruit from orchards in unprotected situations. A close range of evergreen trees has been found of essential

service in protecting the fruit-garden, independent of their value as an ornamental adjunct of the farm.

The preparation of the ground for the transplanting of fruit-trees must be carefully performed. If it is too stiff, while digging it over, small gravel, sand, lime, coal-ashes, animal or vegetable matters, composts that will loosen the soil, in short, almost anything that will render it more friable, will be found useful, and may be added. Nothing benefits soils intended for fruit-trees more than exposure to atmospheric action; and hence, deep ploughing, or, if necessary, trenching and spading to the proper depth, must be attended to before the operation of transplanting is attempted.

The spring of the year will usually be found the best season for transplanting trees, though many prefer the fall; and, where suitable precautions are used, trees may be removed at almost any season. In favour of fall-planting it has been urged, that, during the winter, the roots are accommodating themselves to and taking hold of the soil, and therefore will be ready to proceed with vegetation earlier than if they had been displaced immediately before they were to be called into use. So far as regards the fixing of the tree in the earth by its settling around the roots during the winter, this statement is doubtless correct; but we are inclined to the opinion that roots, during the torpidity or hybernation of the tree grow little or none; and that this advantage claimed for fall over spring planting is more nominal than real. In the germination of seeds, the first roots are formed from the materials already provided in the seed; and, after this is expended, they do not increase until farther matter, elaborated in the newly-opening leaves, is transmitted to them; and, as a necessary consequence, the roots of trees only spread while the warmth of the sun expands the foliage.

In transplanting fruit-trees, there is a common error in placing them too deep A trifle, say an inch

or two, of greater depth may be allowed when planting out, than when the trees are standing in the nursery; but many farmers give them a foot or more of earth over what they formerly had; and this deep setting, by the exclusion of air from an important part of the trunk, produces a bad effect on the whole tree. In setting trees, finely-pulverized earth only should come in contact with the roots; and the trees should be shaken, to fix the particles as evenly and closely around the whole as is practicable. When the holes are filled, the earth should be well trodden down; and, if it is very dry, frequently moistening it will have a good effect in promoting vegetation. In no point, perhaps, is error more frequently seen in the transplanting of trees than in the size of the holes into which they are put. This is almost uniformly too small. The roots, instead of having room to expand or grow in their natural position, are bent, trodden, and forced into the narrow space dug for them; and not unfrequently, where the subsoil is hard, before they have reached any distance in searching for food, they find their progress as effectually intercepted as by a wall of rocks; and, in addition to this, the hole, in such impervious earth, serves as a receptacle for stagnant water, souring and vitiating the juices of the tree, and destroying its health and fruitfulness.

Fruit-trees, when transplanted, are frequently left to take care of themselves; the turf fixes around them, the earth becomes compact and hard, the manure originally added to the soil becomes exhausted, and, as a natural consequence, the vigour of the tree is lost, while the parasitical mosses and fungi seize upon it and claim it for their own. Mr. Prince directs that the turf should be removed from fruit-trees to the distance of a few feet around them, and the earth kept mellow and rich; that the bodies of the trees, to promote their growth, should be washed every year, or brushed over with common soft soap

undiluted with water, and that this course will give a surprising thriftiness to them.

It not unfrequently happens that seedlings, if permitted to produce fruit, yield only that which is worthless, and hence budding or grafting becomes necessary. Indeed, these are the only ways in which the best, or any description of fruit, can with certainty be obtained. Budding or inoculating is performed by inserting the bud of one tree beneath the bark of another; and, when the union is effected, the tree is cut off immediately above the bud, which from that time becomes the leading shoot, and produces the fruit. July or August is the time for budding, and it may be done at any time when the bark will peel freely, to admit the insertion of the bud. The process is simple, and can be learned by any one in a few hours, so that he may thus succeed in obtaining any choice fruit he pleases, the buds of which can be procured. Nurserymen inoculate or bud all their seedlings when young, that there may be no mistake in the kinds or qualities of their trees; and the operation always succeeds better on young trees than on larger ones.

On large trees grafting is substituted for budding, and consists in introducing a twig from a tree producing the fruit it is desired to procure, into another which is of little value. This twig is called a scion, and is cut in the winter, before the sap has begun to circulate. Scions cut in February, and kept in a cool, moist place, will rarely fail of growing when inserted. The earlier grafting can be performed after the circulation of the sap has commenced; and, as soon as the danger of freezing is past, the later well-preserved scions may be inserted at any time during the early part of the season. In orchards, or with large trees, grafting is preferable to budding, and can be practised where the latter cannot be performed. The tree or branch to be grafted, when the ordinary mode is adopted, is cut or

sawed off square, and should be smoothed with a knife, as a wound in wood smoothed is less liable to injure the tree, and heals more readily than one left rough. The cut branch is then split or cleft with a suitable knife, a wedge is inserted to keep the parts separate, and a scion, with one end pointed into a wedge-like form, is carefully placed in the cleft, the bark of the scion and that of the tree being accurately adjusted to each other. Most frequently two scions are put in each cleft, one at each side, and, the wedge being taken out, they are held firmly in their places until the union takes place. As exclusion of the air is requisite, compositions either of clay or wax are used for this purpose, and to facilitate the union of the scion with the stock. Grafting-clay is made of equal parts of horse-manure free from litter, cow-manure, and good stiff clay, to which is added a small quantity of hair, and the whole is well worked into a stiff mortar. Grafting-wax is made of equal parts of rosin and beeswax, and a little tallow. The whole is melted together, turned into cold water, and then worked by the hand, like shoemakers' wax, until it obtains the proper consistence. If spread on brown paper or on cotton cloth, and cut into strips, it can be applied more readily and neatly than in the common mode of using it. There are several kinds of grafting, such as cleft-grafting, or the one we have described, side-grafting, root-grafting, grafting by approach, saddle-grafting, and splice or whip grafting; but they are little used except by nurserymen, and the particular methods may be found in works devoted to the orchard and the fruit-garden. In the selection of scions, those from the horizontal or spreading branches will usually be found better than those cut from the thrifty perpendicular shoots, as they make better bearers.

As our space is limited, we shall only select for notice such fruits as are more particularly adapted

to our climate, referring those who may wish for farther information to Kenrick's Orchardist, Manning's Catalogue of Fruits, Prince's Pomological Manual, and the excellent papers on the Cultivation of Fruit by J. T. Thomas, in the Genesee Farmer for 1838. Mr. Bridgeman, in his Gardener's Assistant, has furnished catalogues of fruits which have been consulted, and we can bear cheerful testimony to the general accuracy and fidelity of his descriptions. In this chapter we shall confine ourselves to fruits which should have a place in every well-arranged fruit-garden; while amateurs, or those whose means will admit, may make as extensive additions as they please.

THE APPLE. *Pyrus Malus.*

The apple has always been one of the most esteemed and valuable of fruits; but, within a few years, two additional causes have conspired to increase the interest felt in the cultivation of this fruit. The first is the introduction of new and valuable varieties, obtained by skilfully carrying out the principles of vegetable crops; and the other is the comparatively recent discovery of the great importance of this fruit in feeding animals. Our orchards have been termed the vineyards of this country; and, though the use of cider as a beverage has fortunately much declined, still much of it will be made for drinking, as well as for vinegar and various culinary purposes. More attention may be expected to be paid to the quality of that made, and the *best* kinds of apples for cider will be in demand as formerly. One of the greatest improvements made in the cultivation of the apple has been the introduction of such varieties that the fruit-orchard can now supply us with fresh fruit the whole year, the later kinds being capable of preservation until the early have ripened.

The apple is one of the longest lived of trees; and

English writers mention instances in which it has attained the age of a thousand years. Some of the first planted in the United States are now nearly or quite two hundred years old, and are still vigorous and productive. The average age of the apple-tree, in favourable circumstances, Knight considers to be not far from two hundred years; but, unless in a good soil, they decay much earlier. Writers on this tree mention instances in which from one hundred to one hundred and fifty bushels of apples have been produced by a single tree; and few parts of a farm are more profitable to its owner than an orchard of well-selected apple-trees. The quality of the fruit in an orchard is greatly influenced by the treatment the tree receives. The apple, as well as all other fruits, in order to arrive at perfection, requires the sun; and hence the fruit on the side of the tree exposed to its influence is always richer than that on the north, or in the central parts of the tree. Pruning exercises great influence on the character of the apple, and this operation should always be conducted with particular reference to the admission of light and air to every part of the fruit-bearing branches. Pruning, in ordinary cases, is delayed until the tree is nearly ruined. It is then performed, perhaps; but such large branches require removal, that extensive wounds are made, requiring years to heal entirely over, and furnishing places in which insects and the dry rot establish themselves, causing the destruction of the tree. To be effectual, pruning should be annual. The branches cut off will then be small; such a shape may be given to the head or top of the tree as is wished; and all danger of bleeding or rottenness from the cutting off of large branches will be avoided.

A variety of opinions have been advanced as to the proper time of pruning; but there can be little question that the *most* proper time is immediately after the sap has ceased flowing, and when the new

layer of wood begins to form. The next best time is the winter. Pruning should be carefully avoided while the sap is flowing, as the extraction of that fluid is injurious to all trees, and particularly so to fruit trees. The reason why summer pruning is to be preferred is found in the fact that the materials for healing the wounds made by this operation have been already elaborated, and are ready for deposition. The consequence is, that granulations of new wood and bark are immediately formed, and, unless the wounds are large, in consequence of previous neglect in pruning, they will be closed almost at once, and farther decay or other injury prevented. A fine, sharp saw is the best instrument for pruning; and in all cases, the stump or wound should be covered with a coating of some composition that will exclude air and moisture. Tar stiffened with brick-dust, or any other substance that will give it consistence, makes a very good application, or thick paint of any kind may be used.

The kinds of apples cultivated have multiplied to such an extent that an enumeration of the varieties will not be here attempted. Fifteen hundred varieties are now cultivated in the garden of the Horticultural Society of London; and more than two hundred are known in the United States. Many of these are of little value, and the kinds required to constitute a good orchard are comparatively few in number. The apple is most usually divided into dessert, baking, and cider varieties; but a division into summer, autumn, and winter fruit will be best understood. It is a singular fact, that many varieties which have proved excellent when cultivated abroad, have been found very inferior here, owing to the climate, or other causes not well understood; and hence no imported kinds that have not been tested by fruiting here can be fully relied on. We give a few varieties of each division.

EARLY OF SUMMER FRUIT.

Early Red Juneating.—This is a small apple, greenish yellow, with deep red stripes, flesh rich, sub-acid, and agreeable. Ripe in July and August.

Early Harvest, or July Pippin.—Bright straw colour, flesh white and rich, juice very fine. It is justly much esteemed, and ripens in July and August.

Sweet Bough. Early Bough.—A well-known and superior fruit. Colour pale yellow, form oblong; flesh very tender, sweet, and excellent. Ripe in August.

Red Astracan.—Skin dark red; apple of medium size; covered with a thick bloom, like a plum; acid. Ripens in August.

Early Summer Pearmain.—Size medium. Bright red on the sunny side; on the opposite, yellow streaked with red; juicy, fine-flavoured, and excellent. Ripens in August.

Summer Pippin.—Pie-apple. This is an excellent apple for cooking. Slightly red on the sunny side, otherwise resembling the Fall Pippin. Ripe in September. Should be found in every fruit-garden.

In addition to these, the Codling, Summer Rose, Williams's Red, Early Buffington, and Sine Qua Non, may be noticed as very fine early apples, and deserving of general cultivation. Williams's Red is a favourite apple in the markets of our cities, and is ripe in September. It originated in Massachusetts. Toole's Indian Apple is a fine fruit, originating at Sodus, in Wayne county, New-York. It is ripe in September, and is good either for the table or for cooking.

AUTUMN APPLES.

American Nonpareil.—A fine apple; colour yellow streaked with red; medium size; flesh rich and agreeable. Ripe in October.

Fall Pippin. White Rennette.—A most valuable

apple; large, smooth, and yellowish green; flesn crisp and tender; juice fine and sugary. Ripens in October, and keeps for some weeks.

Strawberry Apple.—Excellent; colour red; fine, spicy flavour; good for dessert or baking.

Golden Pippin.—Golden yellow. Ripens in November, and keeps until March; highly aromatic, and an excellent apple.

Straat. Stroat.—Introduced by Judge Buel; flesh yellow and tender; skin yellowish green; juice rich and pleasant. Ripe in September, and good until December.

Prince's Red and Green Sweeting.—Green, striped with red; very sweet; juice rich; flesh tender and of excellent flavour. Ripe in September. A superior apple.

Rambo. Seek-no-Farther.—Extensively cultivated; flesh tender, and a valuable fruit. It keeps longer than most autumn apples.

In addition to those we have here named, there are Knight's Golden Pippin, Autumnal Swaar, Alexander, Golden Russet, and many others of fine flavour, and, where room can be had, richly deserving a place in the orchard.

WINTER APPLES.

Baldwin.—Good size; bright red; flesh yellow, rich and juicy; agreeable acid flavour. Ripens in November, and keeps till March.

Spitzenberg.—Red colour with white specks; flesh yellow, slightly acid, and of fine flavour. Ripens in October, and is good through the winter.

Bell Flower.—A beautiful apple; bright yellow; form oblong; flesh tender, rich, juicy, and nigh-flavoured, and equally good for the dessert or for cooking.

Swaar.—One of the very best winter table-apples: large, green, of superior flavour and richness, and should be found in every collection of fruit. Good till March.

Newtown Pippin.—When perfectly ripened, one of the finest apples in this or any other country. Olive yellow when mature; flesh yellow and firm; flavour rich and aromatic; good from December till April.

Rhode Island Greening.—Fruit large; greenish yellow; slightly acid, and of fine flavour; good till April. It is one of the few winter apples good for cooking as well as the dessert.

Roxbury Russet.—This apple is one of the best for late keeping, and is extensively grown for exportation. Medium size; yellow russet colour; flesh rich, sub-acid, and excellent; will keep till June.

In addition to the apples here named as first-rate winter apples, the Gilliflower, Green Sweeting (which keeps till June), Nonesuch, Ribston Pippin, Pearmain, Vandeveer, Large Winter Red, and many others, may be noticed as deserving cultivation, and excellent apples.

CIDER FRUIT.

It is the custom throughout the country. where apples are grown, to work up fruit of every variety into cider, not unfrequently sour and sweet, rotten and sound together; and it is hardly necessary to say that there is as much difference between cider made in this slovenly manner and that produced from good fruit, properly selected, as there is between the latter and Champagne. The value of apples for cider mainly depends on the quantity of saccharine matter developed in the juice, and this is ascertained by its weight; the most valuable being easily determined by the hydrometer. Bridgeman gives the following as the best cider apples of the country.

Harrison.—As a cider apple, this has a deservedly high reputation in the Middle States, and from it the celebrated Newark cider is mostly produced. It is small, yellow with dark spots; flesh yellow, firm,

rich, and the juice sprightly. Ten bushels are allowed for a barrel of cider. which, by distillation, will yield fourteen quarts of spirits.

Newark Sweeting.—This is a good cider apple, and is frequently mixed half and half with the Harrison apple when ground. It is of middle size; skin smooth, colour red and yellow; flesh firm, sweet, and rich.

Hewes's Virginia Crab.—From this fruit is obtained the famed Crab cider. The apple is small and round; dull red, streaked with yellow; flesh tough and astringent, and juice acid. With proper treatment, the cider from this variety is fine.

Granniwinkle.—Skin dark red, and rough; moderate size; flesh yellow, sweet, and rich. It is commonly mixed with the Harrison in making cider. Ripe in November.

The diseases and enemies to which the apple and other trees of the fruit-garden are subject, will be noticed in another part of this chapter.

PEAR. *Pyrus.*

This tree is found wild in Europe as far north as the 51st degree of latitude; and, as experience has proved, when cultivated, is very hardy, and will grow in almost any soil. As it sends down tap-roots like some forest-trees, it flourishes better in deep than in shallow soils; and in a dry, sound one, will live and remain healthy for centuries. Pears can be propagated either by budding or grafting, the stocks being obtained from seed or from suckers; and since Professor Van Mons, of Brussels, commenced his series of experiments with seedling pears, the varieties, which before amounted to some hundreds, have increased to an immense number. Out of 8000 seedling pears fruited by him, 800 varieties deemed proper for cultivating were obtained. Pears are classed as dessert, kitchen, and Perry pears. The first should be characterized by a rich, aromat-

ic, sugary juice, the pulp melting, or, in a few kinds, crisp. Kitchen pears, which are required for boiling, baking, &c., should be rather austere than sugary, and neither soft nor crisp. For making the liquor called Perry, pears may be either large or small; but, according to writers on the subject, the more austere the pear, the better will be the liquor produced. The pear being less spreading in its top than the apple-tree, will bear closer planting, twenty feet distance being sufficient for the pear, while thirty feet should be allowed the apple. There are no finer dried fruits in the world than are prepared from some of the rich sugar-pears dried in the oven; and they will keep for several years without decay or injury. Pears, as well as apples, for the sake of convenience, are divided into Summer, Autumn, and Winter. Pears have so many aliases, or are known by such a variety of names in different countries or parts of the same country, that names are of comparatively little value in making selections.

SUMMER PEARS.

Early Musk Pear, or Primitve Pear of some catalogues, is one of the earliest varieties, but all are not pleased with its flavour. Ripe in August.

Stuyvesant.—This fruit is named from Governor Stuyvesant, of Knickerbocker memory; and the original tree, now more than 200 years old, and still productive, is, or was standing a year or two since, at the corner of 13th street and 3d Avenue, New-York. It is a rich, fine-flavoured fruit, and ripens in August.

Early Sugar.—In goodness this ranks with the Musk Pear, both being more prized for early maturity than positive excellence.

Dearborn's Seedling.—This pear originated in the garden of Gen. Dearborn, at Roxbury, and is a superior fruit. At maturity the skin is of a delicate yellow; the flesh melting, and of the best flavour. Ripe in August.

Madeleine, early Chaumontelle, Harvest Pear.—An old fruit, but a superior one. Some have supposed that this variety of pear has passed its prime, and is in a state of decay; but the evidence does not seem to be conclusive.

To these may be added the Summer Rose, Jar gonelle, Rousselet, Windsor, &c., all good summer fruit, and deserving a place in the garden.

AUTUMN PEARS.

Bergamot.—This pear has been cultivated in England, according to Loudon, ever since the invasion of Julius Cæsar; and is still a vigorous tree, and the fruit fine.

Seckel.—Of American origin; yellowish russet; flesh melting, spicy, and of the richest flavour. The fruit grows in clusters, and is ripe in September. It is worthy a place in every fruit-garden, being in the first rank of this fine fruit.

St. Michael's, White Doyenne, Vergaloo, and at least twenty other names, have been given to this pear, which is a very good one, and extensively cultivated in this country and in England.

Cushing.—Originating at Hingham, Mass. The tree is a good bearer, and the fruit is of the best quality.

A large number of fine pears for summer and autumn fruits have, within a few years, been introduced into this country from abroad, among which are the Golden Buerre, Napoleon, Doyenne Sautelette, Green Sylvange, and others. One of the largest of pears is the Duchess of Angoulême, which is also a fruit of first-rate excellence. It has been known to weigh twenty-two ounces. The greater part of these pears are in perfection in October.

WINTER PEARS.

Chaumontelle.—A capital old variety; size large; yellow tinged with red; flesh melting, musky, sweet, and excellent.

Colmar. Winter Bergamot.—A good pear; in perfection from November to February.

Holland Bergamot.—Greenish yellow colour, marbled with russet; flesh juicy and high-flavoured; keeps till May, and succeeds well grafted on the quince.

Saint Germain.—This is a large, green fruit, at maturity rather yellowish; flesh juicy, saccharine, slightly acid, and delicious. It is an old and celebrated fruit, ripening in November and keeping till March.

Pound Pear, Black Pear.—This tree is a great bearer. Fruit coarse, but good baked in winter.

The cultivation of winter fruit has been but little attended to as yet in this country; but a few of the late varieties of pears in every garden or orchard will be found a great acquisition.

The best method of cultivating pears is to bud or graft on pear-stocks. They will grow well on the apple-stock, but in this state they are not durable, perishing in a few years. On the quince-stock the pear succeeds well; and this mode of production is indispensable where dwarf trees are required. As the borer more frequently attacks the quince than the pear, to avoid this insect, and yet secure the advantages of the quince-stock in retarding the circulation and growth, and increasing the productiveness, the pear-stock is first grafted with the quince, and then, a year or two after, the quince is grafted with the pear, leaving an inch or two of the quince-stock to dwarf the inserted pear.

PERRY PEARS.

The cultivation of the pear for the conversion of its juice into Perry has not been adopted to any considerable extent in this country. Alcoholic liquors and cider have been the substitutes; and the latter will probably remain so. We shall therefore

notice only a few of those the most celebrated abroad for this purpose.

Monarch.—A pear introduced by Mr. Knight, and an excellent variety for the table as well as for Perry. The fruit is large and of a very musky flavour.

Barland.—The specific gravity of the juice of this pear is 1070; and, of course, it makes excellent Perry. The original tree of this variety is growing in Herefordshire.

Oldfield.—A good Perry fruit. From it is made the esteemed Ledbury Perry.

To this class also belong the Holmore, Longland, Huffcap, &c., all cultivated mainly for their juice.

PLUM. *Prunus.*

The Plum is found wild in nearly every quarter of the globe, and the varieties are almost innumerable. The Plum succeeds best in elevated positions, but in all places is liable to suffer more or less from the curculio, which is its greatest enemy. "The Green Gage is considered the best desert plum; the Wine Sour for sweetmeats; but the Damson is the best baking plum."* Plum-trees, in transplanting, will not bear to be set deep; and it is better to secure them by staking than to infringe the laws of nature in this respect. New kinds of plums are readily multiplied from the seed; and old esteemed varieties are propagated by budding on young stocks, in preference to grafting on large trees. Wounds on large plum-trees are not unfrequently fatal, gum exuding freely, and a decay speedily commencing that usually extends to the root, and eventually destroys the tree. The Plum produces but as a standard tree, only pruning out branches that injure each other by rubbing; but it may also be trained as an espalier where gardens are small, or space for its growth is limited. The plum is not a long-lived tree, and those

* Bridgeman

who would have fine fruit of this kind must be careful to renew their plum-trees as the old ones begin to show symptoms of decay. The following are some of the most esteemed varieties of this fine fruit.

Green Gage.—Yellowish green colour, purplish russet next the skin; flesh greenish, full of sweet and perfumed juice, and of delicious taste. Ripe at end of August or first of September. There are multitudes of plum-trees about the country called the Green Gage, generally raised from the seeds of this tree, but not unfrequently wholly dissimilar in their qualities. Some of these varieties, however, are equal, if not superior, to the original fruit, of which the next named plum is a specimen.

Prince's Imperial Gage.—This fine fruit, said by Mr. Manning to be the most productive and profitable of all plums, originated in the Flushing nursery from a seed of the Green Gage, and at once took a high rank among plums. Skin yellow with a whitish bloom; flesh rich and of fine flavour; capital for preserves. Ripe in September.

Orleans, or Red Damask.—Skin dark red with blue bloom; flesh yellow and rich; separating easily from the stone. Ripe in August.

Primordian, or early Yellow.—This is the earliest of our plums, ripening about the middle of July. Fruit yellow, small, and sweet, but not first-rate.

Huling's Superb.—This plum is of the largest size, sometimes weighing four ounces. Greenish yellow; flesh sweet and fine flavoured. Originated from seed in Pennsylvania.

Late Purple Damson.—This is the best plum for preserves. It is tart, but has an agreeable flavour when cooked.

Washington, Bolmar's Washington.—A large, beautiful plum, of superior quality. Colour greenish yellow with crimson specks, and rich bloom. Ori-

ginated in New-York, and has weighed over four ounces. Flesh yellow, firm, sweet, and delicious.

Magnum Bonum, Egg Plum.—Of great size, oval, pale yellow. Excellent for preserves. Ripe in September.

Wine Sour, Rotherham.—An old variety, but excellent for sweetmeats; of medium size, dark purple colour, flesh yellow, juicy, and pleasantly acid. Flourishes best on a porous limestone or gravelly soil.

Coe's Golden Drop.—This is a fine fruit and a good bearer. Colour yellow, with spots of violet and crimson. Flesh gold colour, rich and superior. This is a capital fruit, and worthy of a place in every fruit-garden. It ripens in September, and keeps several weeks.

To the above list may be added, as deserving of cultivation, Bleecker's Plum, Cooper's large Red, Purple Gage, Flushing Gage, Red Magnum Bonum, Morocco, or early Black Damask, New-York Purple, and many others to be found in our principal nurseries and fruit-gardens.

There are thousands of plum-trees about the country that have been partially or wholly destroyed within a few years by the blight; and from its rapid spread when left to take its course, it would seem to be the most formidable enemy to the plum-tree that exists. It makes its appearance usually on the branches, by a cracking of the bark and a protrusion of a fungus-looking mass, that hardens, turns black, gives the branch a twisted or contorted form, and destroys it by penetrating the whole of the wood, and thus arresting the circulation. In some of the finest plum-growing districts of this state, where no efforts have been made to check the disease, the trees are nearly destroyed, and the culture of the fruit in a great measure suspended. The disease is supposed to be the result of an insect which deposites its eggs in the wood, and its action produces the

excrescence and the injury. The only remedy yet discovered is instant and full excision of all the diseased branches, as fast as the fungus appears, committing them immediately to the flames. These excrescences usually appear in June, and trees should be examined through that month and July, and the first appearances of the blight carefully noted and its extirpation effected.

The fruit *curculio* makes its appearance about the time the tree blossoms, and, as soon as the fruit is of the size of a pea, this insect commences its operations upon it. A kind of crescent-shaped mark denotes the place where the egg is deposited. It speedily becomes a worm, which feeds on the fruit, causing it in most cases prematurely to fall, when the worm escapes into the ground, where it undergoes its transformations, and is ready again to attack the fruit of the succeeding year. The remedy for the curculio is plain. Let all the premature fruit be gathered as fast as it falls, and given to the pigs; or, if that is not convenient, or would be too much labour, let the pigs have access to the trees, and the business will be done effectually. Geese also, when kept in fruit-gardens, prove beneficial by eating the defective fruit, and other matters that prove injurious, bugs, worms, &c. It has long been observed, that trees standing in yards where the ground is trodden hard, or by gravelled walks, are less infested with the curculio than others not so situated. Sudden and violent jars of the tree during the time the curculio is most active, will prevent or retard his operations in a great measure; and if, when so shaken off, they are caught on sheets and destroyed, the danger of the fruit being injured the succeeding year is greatly lessened.

PEACH. *Amygdalus Persica.*

In the catalogue of the London Horticultural Society, two hundred and twenty-four varieties are in-

cluded, of which fifty are noted as American peaches. The French consider the Nectarine as a peach, only differing from the common varieties in having a smooth skin; and, so far as their general treatment, propagation, and after-culture are concerned, they may safely be considered as only varieties of the same tree. For the peach, a rich, sandy loam, rather light than otherwise, is to be preferred; and where it is inclined to be heavy, after being made perfectly dry, a large hole must be dug for transplanting, filled with surface-earth, mould, and the lightest earth to be found.

Peaches are readily grown from seed. The best method is to plant them as soon as possible after the fruit is eaten, and they will generally spring up the next summer. If they have become very dry, they sometimes require another season, with the freezing and thawing of a winter and spring, to cause them to sprout. There can be no dependance placed on seedling-trees for fruit, as they rarely, and in the best varieties more seldom than in the inferior kinds, resemble the original kind. This may be accounted for by the fact that trees, like animals, have a constant tendency to return to the original type; and the greater the deviation from that type made by improvement, the more liable will be the young trees to show symptoms of deterioration, and, of course, the greater the necessity of guarding against such changes. Peaches are usually budded, and this operation should be performed in the first or second year of their growth from the seed. They should be transplanted to their places in the orchard or garden early, as young peach-trees are not as much retarded or injured in their growth as larger ones. Peach-trees should be placed eighteen or twenty feet from each other, and not within the shadow of other and taller trees. Deep planting, in the case of the peach, must be sedulously avoided, and the roots allowed to spread freely in the surface soil.

The peach does not remain a bearing tree for a long term of years, though in favourable situations it will live from thirty to fifty years.

The *yellows* is the most formidable disease of the peach-tree, and is particularly dreaded for its contagiousness. On this account, the greatest care should be taken in purchasing trees from nurseries, and introducing them into districts where the disease is unknown, to see that they are free from infection. It does not appear that any remedy has yet been discovered; and the best writers recommend, when a tree is attacked, that it be immediately cut down. One of the earliest indications of the yellows is a premature ripening of the fruit on the whole or a part of a tree, accompanied or followed by a discoloration of the leaves. If the tree is allowed to stand the succeeding year, bunches of sickly, wiry shoots appear on it, and, if not at once checked by the extermination of the tree, the disease may be now expected rapidly to extend to others. Cold weather or frosts will sometimes cause the leaves to curl and change colour; but no danger need be apprehended from this source, as, unless the wood itself is injured, healthy foliage will succeed. The peach is very sensitive to frost or cold; and, being a native of a warm climate, flourishes best in warm exposures, and in soils that readily acquire a considerable degree of heat.

Mildew sometimes appears on the leaves of some of the more tender and delicate varieties. This indicates that such trees require a warmer aspect, a more free circulation of air, and, above all, a drier bottom. Stagnant water about the roots of the peach will most certainly be fatal to the tree, either inducing disease or destroying it at once. The curculio also attacks the peach, but rarely; while the Nectarine is very liable to be injured by them, its smooth skin offering no resistance to their approaches. If they make their appearance, they may

be destroyed by the course of treatment recommended in the case of the plum. The general divisions of the peach are the freestone and clingstone. We copy from Mr. Thomas his list of peaches. furnishing a succession of good fruit from the middle of August until winter. Those who wish to enlarge this list or add some of the new varieties, may consult Bridgeman's or Floy's Catalogue.

Freestones.	Clingstones.
Early White Nutmeg,	Early Newington,
Early Anne,	Diana,
Early Red Rareripe,	Old Mixon,
Early York.	Old Newington,
Grosse Mignonne,	Lemon Clingstone,
Red-cheek Malacaton,	Heath,
Malta,	
Columbia,	
President,	
Morrisiania Pound,	

Some of the best varieties of peaches have originated in this country; such as the Malacaton, Emperor of Russia, Brevoort's early Melter, George the Fourth, &c.; while many of the most esteemed European varieties, when introduced here, are found of very little value. No part of the world exceeds New-Jersey and part of Long Island in the fineness of their peaches. and they are cultivated for the markets of the neighbouring cities with great success and profit.

Mr. Bridgeman remarks, "All the varieties of the peach produce their fruit upon the young wood of a year old, the blossom-buds arising immediately from the eye of the shoots. The same shoots seldom bear after the first year, except on some casual small spurs on the two years' wood, which is not to be counted upon. Hence the trees are to be pruned as bearing entirely on the shoots of the preceding year, and a full supply of regular grown shoots must be retained for successional bearers. Cut out the redundant shoots, and all decayed and dead wood, and reduce some of the former bearers, cutting the most naked quite away."

In transplanting peach-trees, which should be done in the spring, Mr. Floy recommends "that the tree be pruned carefully, and all the young shoots shortened to about one half their length."

CHERRY. *Prunus Cerasus.*

The cherry was introduced into Italy in the year 73, and into Britain in the year 193. The Romans had eight varieties: there are now between two and three hundred. Cherries are grafted or budded on seedlings from cherry-stones; and in this country budding is more practised than grafting, the latter being attended with some difficulties not encountered in inoculating. Seedlings cannot be relied on to produce fruit like the original tree; hence, where budding is not practised, the sprouts or suckers that spring from the roots of the cherry are principally relied on for the propagation of any particular fruit. Cherry-trees produce their fruit, in most cases, from spurs on the sides or ends of the two or three year old branches; hence, where there is room for expansion, the bearing branches are rarely shortened. The Morello, however, bears its fruit on the shoots of the preceding year, and a supply of young shoots must be left in pruning, in every part of the tree, for the next year's bearing. The Mazzards, Hearts, &c., are tall-growing trees; and to remedy this, and form handsome heads, the leading shoot must be cut off when three or four years from the bud; after which little pruning is required, except to remove decayed wood, or irregular, crowded branches. Cherry-trees may be transplanted at any time between the period of the firm establishment of the bud and their bearing, which is generally about the fifth year. The best period for budding is the early part of summer; and as it will not succeed unless performed at the right time, it is better, by frequent examination, to determine this point, rather than leave anything to chance.

Cherries are classed as Dukes, Morellos, or round fruit, and Heart-shaped, or Bigarreans. The following are some of the most esteemed varieties of each.

ROUND FRUIT.

May Duke—Ripens in June; round, red, and of medium size; flesh tinged with red; when ripe, fine-flavoured, with an agreeable acidity. This tree is a good bearer. A multitude of inferior fruits are known about the country by this name, and their worthlessness has tended to bring this original fine fruit into disrepute. It is true of this cherry, as well as most others, that they are rarely allowed to attain perfection on the tree, but are gathered and eaten in an immature state.

Early May.—This is the earliest of the cherries, but has little merit, and is cultivated principally on account of its early ripening.

Richmond.—This is a valuable cherry for cooking, but is rather too tart for eating. It ripens in June.

Amber.—Large and round; somewhat transparent; mottled red and yellow, juicy, sweet, and excellent. Ripe in June and July.

Morello.—This fruit is so called from its juice resembling that of the *Morus* or mulberry. It is a fine round cherry, rich tasted, nearly black when fully ripe, keeps late, and is superior for preserving in brandy or for drying.

Waterloo.—Flesh firm and of good flavour; ripens its fruit in July; large, and, at maturity, nearly black.

Holman's Duke, Carnation, Plumstone Morello, late Duke, and others, are fine cherries, and may be cultivated with profit.

HEART-SHAPED FRUIT.

Amber, Yellow Spanish, Bigarrean.—Yellowish amber colour, but fine red next the sun; very large and heart-shaped; flesh firm, white, sweet, and fine-flavoured: a beautiful and excellent fruit.

Black Heart.—Fruit large, heart-shaped, dark purple; flesh dark red, tender, and excellent flavour. Ripe in July.

Black Tartarian.—This fruit is known by many names, but the one here given is the most generally used. It is a beautiful cherry; large, reaching sometimes an inch in diameter; heart-shaped; dark, shining purple; sweet and delicious. Ripe in June and July. This, by many, is considered the best of cherries.

Mazzard.—The wild cherry. It is cultivated for stocks to bud or graft the superior cherries upon. Its principal use is for making cherry-brandy.

White Tartarian.—Colour very pale yellow, next the sun approaching to amber. It is of superior flavour, and much admired. The tree is a good bearer, and the fruit is ripe in July.

Black Eagle—Is a new variety introduced by Mr. Knight. The tree is vigorous, fruit black, flesh tender and fine-flavoured, fruit middle sized, and ripe in June and July.

Elton.—This is a superior cherry, and was raised by Mr. Knight in 1806. It was produced from the seed of the Bigarrean, which had been fecundated with the pollen of the White Heart. Pale, glossy yellow; flesh firm, rich, and sweet. Ripens after the May Duke.

There are several other cherries that are fine, good bearers, and deserving of cultivation, but the above varieties will furnish a plentiful supply of first-rate fruit. Mr. Manning, who has paid much attention to fruit, and the cherry in particular, has recommended the following as affording a good course. Black Tartarian, Black Heart, White Bigarrean, Elton, late Duke, and Florence.

Few fruit-trees are cultivated with more ease and certainty than the cherry, and hence the greater necessity of paying attention to procuring good fruit. The insects and diseases to which the tree is subject

are not of a formidable kind, and few fruit-trees reward the planter by better bearing. The curculio attacks the young fruit at times, and, when that is the case, the precautions recommended for the plum may be adopted. The Morello is liable to be affected by the blight that attacks the plum, but very few instances have yet been observed by us where the cherry has been injured to any extent by the disease. It will be well, however, to be on your guard, and subject the infected branches to excision and burning at once. Unless this is done, the evil, now fortunately so rare, may become as serious as it is with the plum.

GRAPE. *Vitis, Vinifera, Vulpina.*

Vines may be propagated either by cuttings, layers, or eyes; but plants from cuttings are generally preferred. If the wood is ripe and sound, and the plants well rooted, the manner in which they have been reared is of comparatively little consequence. The vine is found in almost all parts of the world, and will thrive in any soil that has a dry, well-drained bottom. The fruit on very rich soils will be large, but not so fine-flavoured; or, on poorer or gravelly soils, the fruit will be less in size, and not so abundant, but richer in flavour. Many attempts have been made to establish vineyards in this country with European grapes and on European models, but they do not seem to have been very successful; while some fine wines have been made from native grapes cultivated for that purpose. According to Mr. Bridgeman, the following of the imported varieties have been found to succeed best in the vicinity of New-York.

"The Sweetwater, Chasselas, Muscadine, White Tokay, Black Hamburg, Blue Cortiga, Miller Burgundy, Austrian Muscadel, Messlier, Morilon, Black Prince, Blanc, and some excellent seedling sorts from the imported Lisbon grapes. To plant a vinery for

a full crop of good grapes of various flavours, take a white and red Muscat, a white and red, or black Muscadine, a white and red Frontignac, a black or red Muscadel, a white Raisin grape, a white and red Hamburg, a Stillwell and red Sweetwater, a white and red Nice, a black Damascus, a red Syracuse, and a black Constantia. The above list contains some of the most esteemed table-grapes of all colours and flavours, which will ripen in succession. The best kinds of our native grapes for private gardens are the Catawba, the York, Black Madeira, the Schuylkill, Muscadel, and the Isabella. To these may be added the Scuppernong or Hickman grape, which is said to be larger than the Fox grape, of a delightful perfume, and, when ripe, of a yellowish white colour."

Much of the productiveness of the vine depends on its training and pruning; but no certain rules can be given other than that air and light should be afforded to every part of the vine; and it has been observed also, that vines of great length, and the strong shoots at the extremities of the branches, produce fruit of finer quality than the shorter or lateral ones. The wild grape rarely produces fruit until it has reached the top of the tree or support on which it depends, and then, as it begins to spread and the shoots descend, it produces abundantly. In Italy the vine is cultivated with the mulberry; thus a double crop of silk and wine is produced from the same field. Vines trained high, or elevated on walls, tall trees, or houses, suffer usually less from mildew than those growing in more confined situations. All foreign vines need protection in the Northern States, and hence they must be pruned and trained with reference to being laid down in the winter. Of course they must be shortened, and only allowed a height of five or six feet, as is the custom in the vineyards of the South of France, where, however, no measures of precaution during the winter are necessary.

Mr. Bonsall has a large number of American vines growing in his vineyard near Philadelphia, and it is his opinion, after much experience, that we must rely upon them in preference to foreign varieties, so far as the making of wine is concerned. Mr. Bonsall's mode of training is peculiar, but succeeds well. Posts are set in the earth seven feet in height along the rows of vines, and ten feet from each other. Three nails are then driven into each post, to within half an inch of their heads, the first two and a half feet from the ground, one at the top, and the other midway between. Around these nails No. 11 iron wire is secured by a single turn, and continued from one to the other. Around the wires the tendrils cling easily, and the vines are fully supported, while the air and sun penetrate easily every part. Mr. Bonsall trains his vines to produce fifty clusters each, and, when fresh pruned, they will not at any age be more than four or five feet high.

To protect European varieties, it is necessary to lay them down and cover them with earth. To do this, prune them in autumn, disengage them from the trellis, bend them to the earth, and, after placing some flat stones upon them to keep them in a proper position, cover them with at least three inches of earth. The European kinds require renewal every few years in our climate, or the fruit mildews in such a manner as to be worthless. In its native climate the vine lives to a great age, as is proved by the vineyards of Italy and France, some of which are known to be several hundred years old; and by the great age attained by our native vines.

Those who think of cultivating the vine for wine, will doubtless make themselves acquainted with the works that treat on that subject fully; while those who wish to cultivate for the market or their own tables, and all should do the last, will find little difficulty in succeeding.

QUINCE. *Cyclonia.*

The Quince may be propagated by seed or by layers, and cuttings in a moist soil will succeed. Quince-stocks are much used for producing dwarf pears, but the summer or autumn pears succeed better on these stocks than the late ones. If more than one shoot springs from a layer or cutting, all should be removed but the most vigorous; which should be preserved with a high, clear stem for the main stem or for grafting. The Quince produces the most abundantly, and the fruit is of the best quality, when grown in a rich, moist soil, in a sheltered situation.

Austere as the fruit of the quince is, the curculio sometimes attacks it; but the chief enemy of this tree is the borer, which is the larvæ of an insect, the egg of which is deposited in the bark near the surface of the earth, and the worm produced from it feeds on the wood, usually eating upward. It is not so readily observed as the peach borer, as that insect throws out the dust made in his progress, while the quince borer packs his immediately after him. Extracting the insect by direct excision is the best mode; but when it has penetrated to any considerable depth, this is difficult, and it may then be drawn out with a flexible barbed wire, operating like the barbed tongue of a woodpecker. All wounds made in extracting the borer should be dressed at once with a thick paint, or with tar and brickdust, to prevent the decay of the tree.

There are many varieties of this fruit, but the following may be considered the most worthy of cultivation.

The *Pear Quince.*—An oblong fruit, much resembling the pear in form. It is not as common as the varieties succeeding, and is, for general uses, rather inferior. It is, however, a good fruit.

The *Apple* or *Orange Quince.*—This is the one most deserving of cultivation, and is the one gener-

ally found in gardens. It is a large fruit, of a rich dark yellow, and is deservedly esteemed for its cooking properties.

The *Portugal Quince.*—The fruit of this variety is less austere and more juicy than the preceding ones, and is much prized for marmalade and preserves, having the property of assuming a fine purple tint while undergoing the culinary process. It is rather a shy bearer; but, though not common in the United States, is the kind generally cultivated in England. Loudon recommends this as the best variety for inserting the pear upon.

The *Eatable Quince.*—The distinguishing character of this fruit is its being less astringent and austere than the preceding kinds, and hence is considered eatable. Few palates, however, relish this or any other variety, unless prepared for the table by cooking.

There is no fruit grown in our country so valuable for marmalade and preserves as the quince, and, as a natural consequence, none that finds a more ready market. Every fruit-garden should contain a few trees of each variety. They are planted about ten feet apart, and require little attention or pruning.

RASPBERRY. *Rubus.*

Among the minor fruits, the Raspberry, both cultivated and common, holds a distinguished place, and is much esteemed as a table-fruit and for culinary processes. There are several species of the *Rubus* that grow spontaneously in the United States, such as the Black and Red Raspberry, the Blackberry, Cloudberry, &c. In Europe the Blackberry is known as a bramble. Nicol, in his work on fruits, enumerates twenty-three varieties of the cultivated Raspberry, and twenty-one of the bramble or wild varieties. Mr. Prince's catalogue contains nearly thirty varieties, or names of varieties.

All the varieties of this family are easily perpetu-

ated or propagated by the young suckers or shoots that spring up abundantly in spring or summer from the roots of the older plants. They can also be raised from the seed, and will bear the second year; while suckers of one year's growth, detached and transplanted in spring or autumn, will bear some fruit the first year. The best of the wild varieties are the Red and Black Raspberry, Blackberry, and Virginia Raspberry; and, of the great number of cultivated kinds, the most esteemed are the small and large White, Red Antwerp, Large Yellow Antwerp, Brentford White, Twice-bearing Red, &c., &c.

Raspberry-beds are the most productive about the fourth year; and, when properly taken care of, the ground loosened and the dead wood cut out, will continue to bear well for five or six years, when, if they exhibit symptoms of failure, they may be replaced by new shoots. Vigorous shoots from stems in full bearing are to be preferred. The Raspberry, in ordinary gardens, succeeds well in single rows or in a hedge form; and a selection of the most shady, as well as the most sunny part of the garden, will give a succession of fruit for a long time. All weeds and superfluous suckers must be carefully eradicated, except such suckers as may be wanted to form new beds or hedges, or to continue the old. Vines that grow too long will produce more, and finer fruit, if properly trimmed; and, to have them vigorous and good bearers, rotten manure or compost should be forked in around the roots of the plants.

The Raspberry is much esteemed for sweetmeats, jams, tarts, and sauces. It is also very delicious served up with cream and sugar, and is grateful to most palates. Like the Strawberry, it is a fruit conducive to health, as the acetous fermentation it undergoes in the stomach is very slight; and, consequently, it is adapted to persons troubled with rheumatism or gout. A row of a few rods in length

against one of the walls or fences of the garden will secure an abundant supply of fruit, if set with either or both of the Red and Yellow Antwerps, or tho common Black Raspberry, the size and productive ness of which last fruit is much increased by judicious cultivation.

STRAWBERRY. *Fragaria.*

Of this most delicious fruit, it has been rightly said, "There are few in the vegetable kingdom that can equal the Strawberry in wholesomeness and excellence." Strawberries are natives of most temperate or cool climates, and are found wild in great numbers both in America and Europe. Fortunately, the Strawberry unites properties the most conducive to health, with a fragrance and taste peculiarly grateful, which render it one of the most general favourites among fruits.

The methods of planting the Strawberry are very various, some cultivators preferring hills, others rows, and others beds, in which the plant occupies the whole surface of the ground. When it is remembered that the Strawberry, though a low plant, has very strong roots, and that convenience in gathering the fruit is also to be consulted, it is evident that some little space should be allowed to each plant, and that, consequently, hills or rows will be better than closely-covered beds. Perhaps beds, with three rows each, eighteen inches apart, and a space of two feet between the beds, will be found to economize space as well as any other method. Mr. Downing, of Newburg, recommends hills; and Mr. Darke, of Ohio, also prefers hill-planting, as it allows spading each way. Hills must be from eighteen inches to two feet apart.

The preparation of the soil is a matter of much importance in forming a strawberry plantation; for, though the plant will grow in almost any soil, experience shows that under certain circumstances only

will it produce fine and abundant fruit. A proper strawberry soil must contain a good supply of vegetable matter; hence the wild Strawberry, growing on newly-cultivated lands, is usually very fine, and decayed wood and leaves have been found some of the best materials to incorporate in the strawberry-bed. The earth must be made fine and deep by spading or other means, and thoroughly-rotted manure or compost fully incorporated with every part of the loosened soil. A deep, mellow loam, moderately moist, and well filled with vegetable matter, is found best for the Strawberry; yet it will succeed in almost any soil where the requisite depth and richness are given.

There are very numerous varieties of the Strawberry, and they are classed in the catalogue of the London Horticultural Society under the heads of Scarlet, Black, Pine, Chili, Hautbois, Green, Alpine, and Wood Strawberries. Of all the different kinds, the Wood or Field Strawberry is the highest flavoured, and the Alpine is probably the most prolific. The Methven Scarlet is one of the largest, not unfrequently measuring four inches in circumference; and the Downton, a variety of the Chili, originated by Mr. Knight, was grown by Judge Buel, for several years in succession, to the size of four inches and three fourths.

Of the many varieties, the following may be recommended as making a good selection for gardens. The Wood and Scarlet Strawberries of the native kinds; the Downton, Keen's Seedling, Wilmot, Blood Pine, and Elton's Seedling of the dark or black kinds; of the Hautbois, the Black Hautbois and the Twice-bearing; and of the Chili, Wilmot's Superb and Keen's Imperial. The Alpine produces fruit from June till November, or until prevented by the frost from coming to maturity. Wilmot's Superb does not always succeed here, and the Methven Castle is sometimes hollow and worthless; and, as

a general rule; it may be remarked, that the large kinds of fruit are not as high-flavoured, and are more liable to be defective than the middle-sized or smaller varieties. Mr. Downing recommends the Bishop, as uniting all the qualities required to make a fine and delicious strawberry.

Strawberry plantations may be established either in spring or autumn; and April or September have been pronounced the best months for transplanting. The plant is easily propagated by runners, which, rooting at each joint, only require separation and removal to constitute a new plant. If these roots are taken up in September, they will produce fruit the next season. From the large mass of foliage and flowers produced from a single root, it is evident that, until the fruit is set, large quantities of water are required; but afterward a dry bed, and a dry, sunny air, give the richest fruit. To have good fruit, the runners must be cut off from the bearing plants, as they exhaust the juices; the ground must be kept perfectly clean and free from weeds; and, for the larger varieties, covering the earth with wheat or rye straw during the period of fruiting makes the berry ripen better, and keeps it from contact with the earth. Oat-straw is said to cause the fruit to mildew. Dry leaves will do in the place of straw, and, after the bearing season is over, they may, with other compost, be spaded or worked in as manure.

Many persons, in cultivating the Strawberry, have experienced much disappointment in finding that their plants, though growing luxuriantly and blossoming freely, produced no fruit. This is accounted for by their having made an unfortunate selection of plants for their beds. Strawberry-plants are of two kinds, *fertile* and *unfertile*. Every one who has noticed the common field Strawberry is aware that some patches of vines produce every year abundance of large, showy flowers, and little or no fruit while others, with flowers of little show, are uniform

ly fruitful. The same causes are operative in the cultivated plant; and, if the transplanted sets or roots are from unfertile stocks, no fruit can be expected, however vigorous the growth. The greatest care, then, seems to be necessary in commencing a bed or plantation to select productive plants, as in this case, as well as most others, like produces like, and, if unproductive ones are chosen at first, unproductive ones will be perpetuated and multiplied, and the reverse if fruitful plants are selected. In some instances, the non-bearing plants in a bed are the most vigorous; and, if attention is not given to them, they will crowd out the bearers and occupy the whole bed. On the subject of fertile and unfertile plants, Mr. Downing makes the following very just remarks:

"If any person will examine a bed of the Hudson or any of the large scarlet strawberries when they are in blossom, he will discover a great number of plants that bear large, showy blossoms, filled with fine yellow stamens. *These are the barren plants.* Here and there, also, he will discover plants bearing much smaller blossoms, filled with the heads of pistils, like a small green strawberry. *The latter are the fertile ones.*"

By attending to these distinctions in selecting plants to make new beds, or in separating those already made, fertile plants are ensured, and all disappointment in the result avoided. If it is desirable to cultivate the strawberry on a very dry soil, it may be done either by incorporating clay marl with the compost used, so as to render the soil more retentive of water, or the beds may be made (instead of being higher than the general surface of the garden, as they usually are) lower than the other parts, so as to receive as much of the water that falls as possible.

When we recollect the astonishing quantity of this fine fruit that can be grown on a few rods of

land, when the varieties are well selected; its delicious and healthy qualities, and the ease with which it can be cultivated, it must be considered surprising that so little attention is paid to it, not only by mechanics and professional men who cultivate gardens of their own, but by farmers, who certainly should devote a small space of ground to this most valuable of fruits.

CURRANT. *Ribes.*

This well-known shrub is found in almost every garden, and the fruit, where good varieties are selected and the plant is properly cultivated, is deservedly esteemed. When fully ripened, the currant is prized as a dessert fruit; and in an earlier stage is used for pies and tarts. A good wine is also made from it with little expense or trouble, and might easily be made to supersede the cheap imported wines, as, when well made, it is certainly superior to the most of them. There are many varieties of the currant, red, white, and black; and varieties of the cultivated kinds may be multiplied to any extent by sowing the seed. The best and most usual mode of propagation is by cuttings from the last year's growth, and healthy, vigorous shoots should be chosen.

In common with most other fruits, the currant succeeds best in a good loam, but will grow in almost any soil that is sufficiently deep and rich. This shrub will grow in the shade of trees; but the finest and best flavoured fruit is found only in situations exposed to the sun, and open to a free circulation of air. Currants are commonly planted in rows around the borders of gardens, where they are left to take care of themselves, and soon throw up such a multitude of suckers that the fruit becomes inferior from the crowding of the branches, and the want of thinning and pruning.

To prevent this multiplicity of shoots, and give

every plant a single, tree-like form, tall shoots should be chosen as cuttings, and from these every eye or bud on the lower part, and to the height of some inches above the ground, when they are set out, must be carefully removed with a sharp knife. In this way few or no shoots will appear, and the plants, standing single, will form good heads, and produce fruit of a much finer quality than that grown on plants cultivated in the usual way. By training in this way, removing the suckers as they appear, cutting out dead branches, shortening such shoots as show a disposition to grow too much wood, and keeping the earth clean about them, good fruit may be confidently expected.

The Red Currant is perhaps more common than any other, and is generally thought the highest flavoured; but we prefer some varieties of the White, as being a larger fruit, sweeter, and better adapted to the dessert than the Red. It also makes a good white wine, preferred by some to the red wines. The flavour of the Black Currant is peculiar, and disagreeable to many. It is frequently found in swamps, or low, moist places, but is comparatively rare in gardens, and, when grown, it is usually for its medicinal uses, being strongly astringent, and employed for making a gargle in sore mouths or throats attended with inflammation. It is very common in the north of Europe and Asia, and is made much use of by the Russians for various purposes. According to Loudon and others, the best white currant is the White Dutch, and Knight's varieties of early, large, and sweet Reds. There are several other kinds of currants, such as the Rock, Pennsylvania, Mountain, Upright, Wild, and Champagne, but they are little cultivated.

GOOSEBERRY. *Ribes Grossularia*, etc

The English cattle-grower has his Herd-book, to which he refers to determine the purity and blood

of any animal offered to him ; and the English gooseberry-grower also has his Gooseberry-book, in which the varieties and their qualities are as carefully recorded, and to which constant reference is made when this fruit is under discussion. Upward of 700 varieties are known, most of them the result of crosses ; and in Lancashire and other goose berry districts of England, fairs are annually held, at which prizes for the best fruit are distributed in sums of from ten shillings to ten pounds sterling, when the names and sizes of the winning fruits are entered in the "Gooseberry-book." One variety, the "Roaring Lion," has been known to reach the weight of an ounce and a half to a single berry ; and many kinds have produced berries exceeding an ounce in weight. In Lancashire, where the cultivation of this berry is carried to greater perfection than in any other part of the world, not only is the ground made very rich, but applications of the drainings from dunghills is occasionally made ; and, while the roots of the plants are kept well watered, suckling, as it is called, or placing a sewer of water immediately under the fruit, is practised to a considerable extent by the competitors for these prizes.

Gooseberries are propagated with the greatest ease in several ways, but cuttings are most generally used. These should be taken in the autumn from healthy, vigorous shoots, the buds, with the exception of two or three on the upper part, cut off, as directed for currants, and the plants placed in a good soil. Gooseberries may be planted in rows six or eight feet apart, and should be five feet from each other in the rows. Where so much space is not convenient, the plants may be trained to a single stem, and tied to a stake ; this, though the stems are six or eight feet high, if properly pruned, will admit closer planting, while the circulation of air and the production of fruit will not be prevented.

Unfortunately, nearly all the varieties of the Eng-

lish gooseberries, and particularly those of the largest kinds, have been found so liable to mildew in this country as to be almost worthless, and many gardeners have given up their cultivation in despair. To what cause this disposition to disease is to be traced does not seem to be satisfactorily known. Whether to defects in the culture, too much crowding of the plants, or too little pruning of the branches, or whether to some peculiarity of our climate, such as its greater heat and more sudden changes during the summer months, is undecided. Probably all these causes are operative; but we think the climate is the most likely to be the principal agent in this disorganizing process. No method of preventing the mildew is yet known other than close pruning, and a free circulation of air to every part of the head of the plant.

There are several varieties of native gooseberries, some covered with strong, close prickles or spines, and some that are smooth like the English kinds. One of the wild kinds grows in swamps, is smooth, covered with a bloom like the plum, and in tallness much resembles the cranberry. It is a shy bearer, and the fruit rather small, or it would be a desirable variety for many uses. The native varieties are the finest flavoured, and might probably be improved by cultivation. As it is, they make a fine, close hedge or border for gardens, and deserve a place in every collection of fruit, as they usually produce abundantly, and are, so far as we have noticed, perfectly exempt from mildew. The common gooseberry, cultivated in the usual manner in borders or hedgerows, lasts many years, and requires little or no attention.

Gooseberries are a very delicious fruit, and the larger varieties, when free from mildew, are highly prized for the dessert. The smaller kinds make the richest of pies, tarts, &c.; and gooseberry wine is of the finest flavour when properly made. The fruit-

garden cannot, therefore, be considered properly furnished without this fruit; and it is to be hoped the difficulties that have attended the cultivation of the improved varieties will be so overcome by acclimization or otherwise as to render its success certain.

Writers on the Fruit Garden enumerate a variety of other valuable productions; but, as the most of them are not adapted to general cultivation, or require more attention than farmers or others can well bestow, we have not deemed it necessary to enter into particular details as to culture. Of these we may here enumerate the Apricot, Almond, Chestnut, Cranberry, Fig, Hazelnut, Filbert, Mulberry, Madeira Nut, and Hickory Nut. Those who wish to introduce the culture of these trees will find ample directions in the various works on trees, fruits, and gardening that have been published.

DISEASES AND DEPREDATORS.

Fruit-trees are liable to diseases and to attacks from insects, some of which prey on the wood of the tree and others on the fruit. Some of these we have already indicated; but a few additional remarks will not be out of place on this topic. A bad, wet, cold soil is one of the most fruitful sources of disease, and the remedy is obvious; make the soil dry by draining, and rich and loose by manuring and digging. When trees appear to be unhealthy; when their leaves look yellow or curled; when shoots spring from the roots, or bundles of shoots from the branches; when gum oozes from the bark, and that integument is discoloured or cankered, disease is present, and the tree should be examined, and the cause discovered and removed if possible. In most cases, moving the earth around the body of the tree; cutting off and burning decayed or diseased branches; scraping the trunk and large branches, and washing them with ley, whitewash, soapsuds, or

other similar applications, will produce a good effect, and restore vigour. Trees attacked by mildew may be sprinkled with soapsuds, and dusted with snuff, tobacco-dust, or sulphur; if canker is observed, let the part affected be cut clean out in such a manner that no water can remain in the wound, and then wash the place with a mixture of soot and water, after which it may be coated over with train or other oil, and soot or brickdust used to thicken it and give it a proper consistence.

Of the insects that attack trees and fruit we have already noticed the curculio and the borer, and the best means of preventing injury from their presence. There are two insects that seem to prefer the apple-tree to other fruit-trees, which are very destructive, and in some seasons ruin the fruit of whole districts. These are the caterpillar and the canker-worm. The caterpillar is the product of a moth, which deposites its eggs in a thimble-like form around the outer shoots of the apple branches in autumn, where they remain during the winter, and are vivified by the warmth of spring about the time the buds open to supply them with food. If they appear early, a second crop is sometimes produced late in the season, but usually in less numbers than the first. These caterpillars do not eat the fruit; they injure it by destroying the leaves necessary to the elaboration of the juices that go towards perfecting it. Nothing but a little attention is necessary to free an orchard from this pest. The silklike nest spun by the worm shows itself at once, and a rag or a brush on the end of a pole, applied while the worms are in their nests, will wind up and crush the whole.

The canker-worm is a more serious and destructive enemy than the caterpillar, in those parts of the country where it is found. Its habits are such that it is less readily observed, or its depredations prevented. The female of the canker-worm is wingless, and, when it emerges from its chrysalis state in

the earth, it is obliged to climb the tree on which it is to feed. In this state it resembles a grub. The male has wings, but usually ascends the tree in company with the female. The eggs are deposited on the branches, and from these the worm which is so destructive proceeds. When the period of change to a chrysalis arrives, the worm descends to the earth, generally by spinning a web, and, hiding beneath the surface, remains till the change is completed, and again emerges in another form to recommence its ravages. As the insect, in the state of chrysalis, is limited to the spread of the branches at farthest, and in most cases is within a few feet of the trunk, moving the earth or incorporating with it ashes, lime, or other ingredients destructive or disagreeable to them, would seem to be likely to kill them or drive them away. Bandages of tar, fish-oil, and other matters have been recommended; but the only effectual remedy yet known is the expensive one of encircling the tree with a lead trough filled with oil, the space between the trough and the trunk being closely packed with some substance that will prevent the passage of the worm. As the trough is occasionally replenished with oil, a passage over it is impossible, and, of course, all access to the tree is cut off. The great length of time, however, in which the grub or worm ascends to deposite its eggs, reaching from November till June, renders the prevention of the attacks of this worm more troublesome than that of any other. Whenever the ground is thawed during the winter, the worm will be found ascending; and, after it has once obtained a lodgment in the tree, all methods to expel it have been ineffectual.

THE END.